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Meeting More Rigid Specifications

New Heat-Treating Equipment for Bolts Designed for Accurate Control and Large Output— Plating Room Flexible

BY FRED L. PRENTISS*

TO effect close control of its heat-treating operations in the manufacture of bolts, to produce a product uniform in quality and to meet the more rigid specifications of consumers as to physical properties, the Lamson & Sessions Co., Cleveland, recently placed in operation a new heat-treating department equipped with electrically operated drawing furnaces, in which all cold-headed work except stove bolts are heat treated. Interesting features of this department include a compact and efficient arrangement of the equipment, an automatic quenching machine designed to assure uniformity and quality of product and the provision of roller tables and overhead handling equipment to reduce labor to a minimum.

The company has added a plating department which shares, with the heat-treating department, the fourth floor of a new 80 x 140-ft. manufacturing building. While the two departments are separated by a partition, they are connected by roller conveyors for carrying to the

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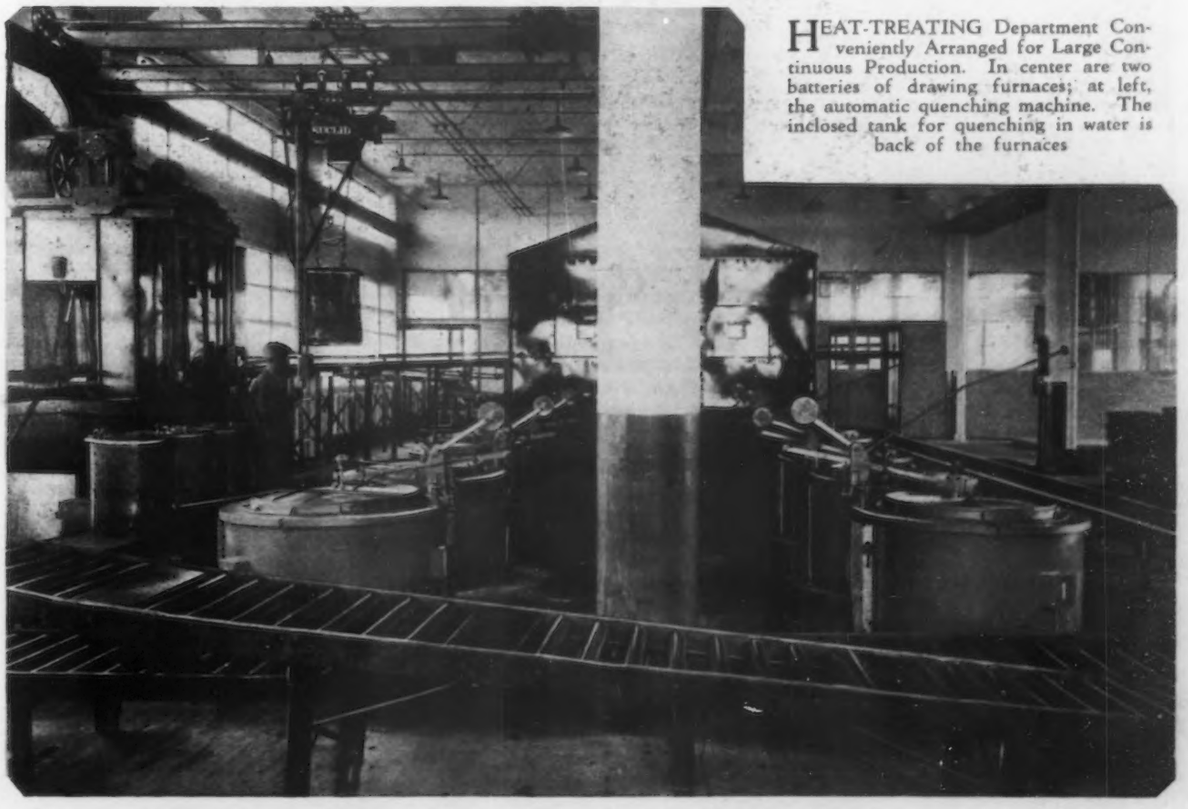


HEAT-TREATING Department Conveniently Arranged for Large Continuous Production. In center are two batteries of drawing furnaces; at left, the automatic quenching machine. The inclosed tank for quenching in water is back of the furnaces

plating department, after drawing and quenching, work which is to be plated.

More exacting demands of consumers of steel in various forms have spurred manufacturers of bolts as well as of other steel products to improvements in processes and methods. At the same time competition has been an incentive for introduction of better manufacturing methods to reduce production costs. Bolts regarded as satisfactory not long ago do not meet present specifications of many buyers, particularly in the automotive field.

Formerly buyers were satisfied with bolts having a tensile strength of 45,000 to 50,000 lb. per sq. in. Now there is a tendency to demand a product with a tensile strength of 80,000 lb. and higher in plain carbon steel, and up to 125,000 lb. per sq. in. in alloy steels. Buyers have become more particular, also, in respect to tolerances of the other physical properties, particularly hardness, resulting in specifications that hold to a closer range in Brinell numbers.

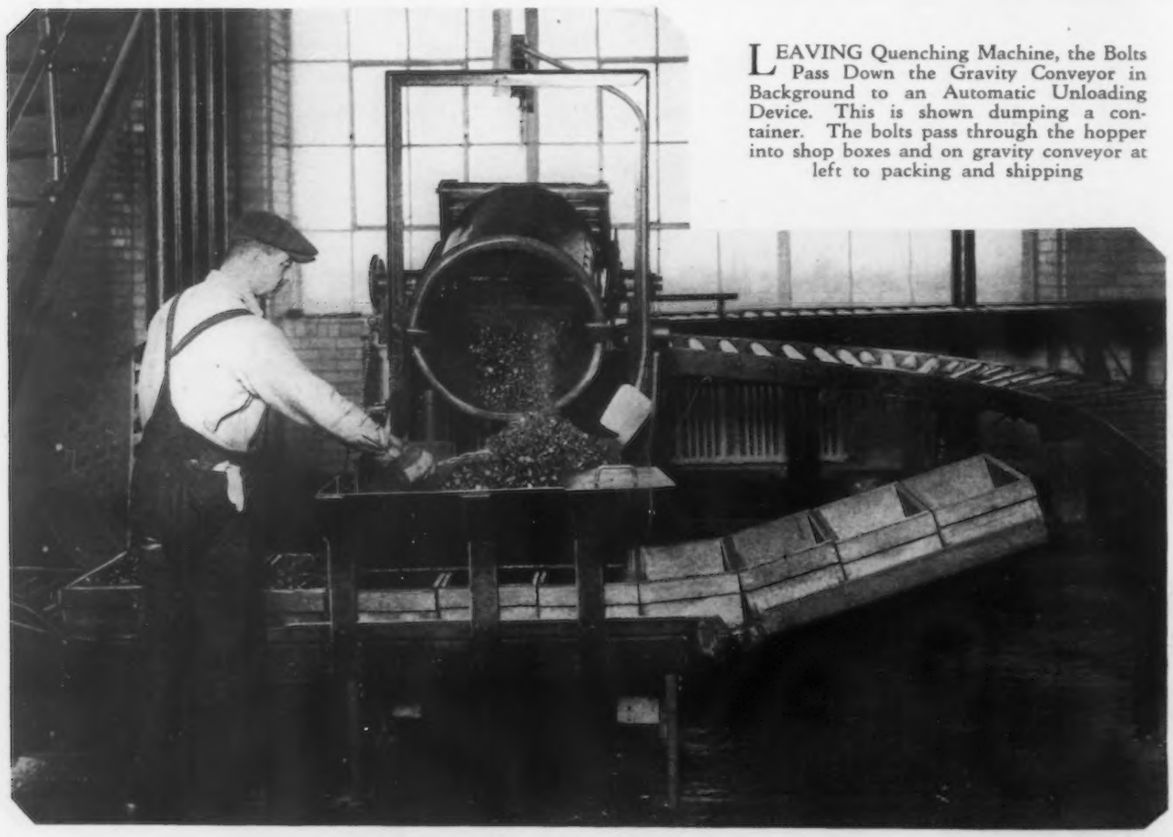
Some consumers are interested mostly in tensile strength, others in Brinell hardness, wanting it high or low, depending on their product, and still others in the elastic limit. Although tensile strength and hardness are the two physical properties given most importance by exacting buyers, some have strict requirements in respect to all three of these properties. Some also include specifications covering elongation and reduction in area. In addition, and perhaps no less important, is the demand for closer dimension limits. This necessitates avoidance of scale.

Gas Furnace for Hardening

Hardening, the first heat-treating operation, is done in the Lamson & Sessions plant in a gas-fired rotary furnace in the basement. The bolts are kept in the furnace from 60 to 90 min. at 1450 deg. to 1600 deg. Fahr., depending on the steel and the customer's requirements. This furnace is used also as a carburizing furnace for bolts which are to be case hardened and not subjected to any further heat-treating operation. An electric furnace of the continuous conveyor type, will be installed shortly in the heat-treating department, to supplement the gas-fired furnace for hardening high-carbon and alloy steels.

Bolts after heating for hardening are brought from the second floor to the heat-treating department in shop boxes on an automatic lift and dumped into containers on a roller conveyor that passes along the side of the furnaces. They are drawn in Homo furnaces, of which there are eight of 40 kw. capacity arranged in two parallel groups.

Space is provided for eight additional furnaces of this type. Another roller conveyor leading from the automatic lift will be placed parallel to and back of the one now passing in front of the first row of furnaces. From this the boxes of work will be lifted over to the second conveyor, and dumped into the containers in which they are charged into the furnaces.



LEAVING Quenching Machine, the Bolts Pass Down the Gravity Conveyor in Background to an Automatic Unloading Device. This is shown dumping a container. The bolts pass through the hopper into shop boxes and on gravity conveyor at left to packing and shipping

Each row of furnaces is served by a crane with 16-ft. span and carrying an electric hoist. The crane has electric drive for both movement of the hoist along the span and movement of the bridge along the crane runway. Current for the longitudinal movement is supplied by three rails suspended from the ceiling. The containers, circular buckets 24 in. in diameter and 30 in. deep, have a capacity of 800 lb., which is the usual furnace load.

The drawing furnace temperature ranges from 1100 to 1200 deg. Fahr. and the work is kept in the furnace from 45 to 75 min., depending on the grade of steel and the physical properties required. From the drawing furnace the hoist carries the container to the quenching machine. This consists of a tank 4 ft. x 8 ft x 4 ft. deep, with automatic mechanism with push button control for handling the container in and out of the tank. The

quenching solution is soda water and a small percentage of soluble oil.

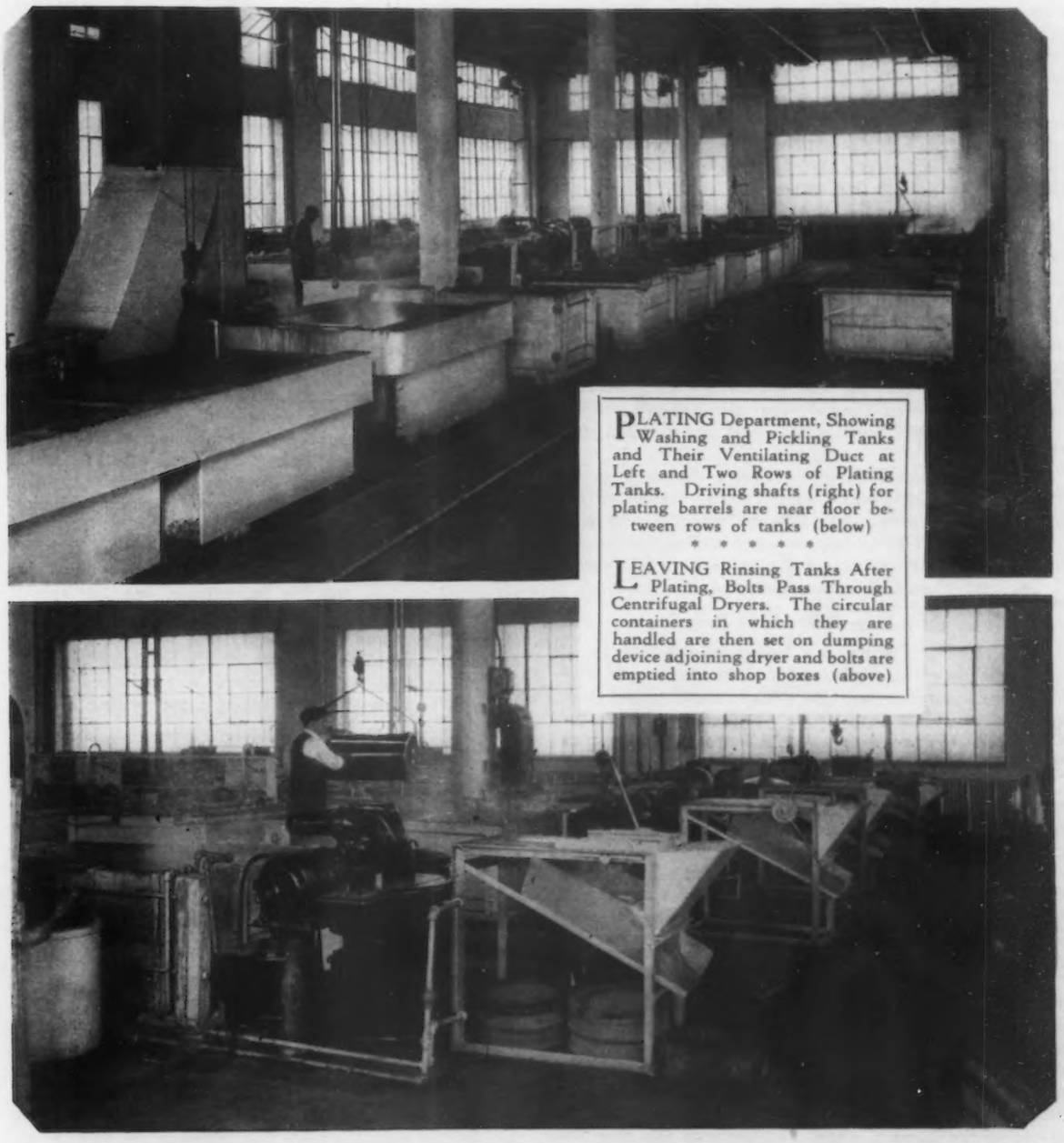
Quenching by Automatic Lowering Device

Lowering the container into the quenching tank is controlled by a variable-speed drive. When the bucket of work reaches the solution its speed is materially reduced; when it is lifted out the same speed is maintained until the container is out of the solution, the speed then being about doubled. Because of the slow dipping in the quenching solution instead of rapid immersion, the liquid slowly seeps through the work, not causing a large amount of steam and insuring a uniform quenching. The quenching solution is heated in the morning to a minimum of about 130 deg. Fahr., by means of steam coils, and is kept normally at approximately 180 deg., although the heat from the work sometimes brings it up to the boiling point.

The function of the soluble oil is to give color to the product. The temperature of the work is high enough to carbonize the oil and the work comes out with an attractive black coating, which will prevent oxidation for some time. The supply of oil is replenished occasionally by dumping a bucket of fresh oil into the quenching tank. The cycle for immersing the work in the solution, quenching and raising it from the tank takes 5 min.

As the bolts are handled in large quantities, there is little surface exposure to the air during the short time required for moving them from the drawing furnaces to the quenching machine. Thus formation of scale is avoided and there is assurance that the pitch diameter will not be changed. The heat-treating methods followed, it is stated, result in a product uniform in tensile strength and in hardness. A cup fracture is produced on tensile testing and the structure has a silky appearance. The bolts are held within the National Screw Thread Commission's tolerances for class 2 and 3 fits. The pitch diameter is held within 0.002 and 0.003 in.

On being lifted from the quench the container remains above the tank about 5 min., or until the next container



PLATING Department, Showing Washing and Pickling Tanks and Their Ventilating Duct at Left and Two Rows of Plating Tanks. Driving shafts (right) for plating barrels are near floor between rows of tanks (below)

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LEAVING Rinsing Tanks After Plating, Bolts Pass Through Centrifugal Dryers. The circular containers in which they are handled are then set on dumping device adjoining dryer and bolts are emptied into shop boxes (above)

is brought to the tank, that time being sufficient for the work to drain. The container then moves on to a roller conveyor which carries it a short distance to an automatic unloading device, which dumps into a hopper. The empty container is switched on to another roller track which moves it back to a position in front of the furnaces for reloading.

From the hopper the bolts pass to a gravity roller conveyor which carries them 350 ft. through an inclosed runway over the roof of an adjoining building. This conveyor connects to a spiral conveyor which carries the boxes of bolts down to the packing and shipping department.

A second quenching tank is provided for quenching in water those bolts which are to be plated. The overhead hoist delivers the containers of work to this tank. After quenching, the containers are placed on a roller conveyor that leads into the plating department.

Efficiency in handling the work is being increased by the use of work containers handled with tongs. These are suspended from the hoist. When the latter is raised the tongs grip over a lug that extends around the top of the container. When the tongs are lowered they release hold on the container. With the use of the tongs containers with eyes and a handling device with hooks, requiring hand labor in hooking and unhooking, will be eliminated. For drawing and quenching small lots the company has devised circular sheet metal boxes holding 150 lb., five of these nesting in one of the standard containers.

Control equipment for the drawing furnaces is located in a glass-inclosed mezzanine room overlooking the furnaces. Each furnace has independent heat and production control from instrument boards designed by the company. Red signal lights and a bell are used to signal the operator when the furnace is turned off.

Three Men—9600 Lb. an Hour

With the eight furnaces a bucket holding 800 lb. of bolts is heat-treated every 5 min. or at the rate of 9600 lb. an hour. However, with the efficient handling and other facilities only three persons are required to operate the department—a furnace operator, a helper and a man in the instrument room.

Freedom from smoke and fumes and the clean appearance of the room are conspicuous features of the heat-treating department. The cleanliness is due to the unusual attention that has been given to ventilation. The furnaces are set through the floor, the bottoms being a little below the ceiling of the floor below and the tops at a convenient working height for the furnace operator. The furnaces themselves are equipped with a ventilating system for carrying away the fumes.

An air outlet is provided by a 2 x 7-in. duct connected to the top of each furnace and extending down the outside to an 8-in. diameter duct that extends along the third floor ceiling beneath. One such duct serves each battery of four furnaces and the air through the two ducts is drawn out by one fan and exhausted at the side of the building. Air to replace that drawn out is admitted into the top of the furnace, where an aluminum slip ring fits loosely around the furnace cover and provides an air inlet.

One feature of the furnaces that does not have to do with ventilation is the elimination of the usual cylindrical screen in the center of the containers. The air placed in circulation by the fan in the bottom of the furnace is forced through the work, instead of through the cylindrical screen. This is proving a satisfactory method of air circulation and at the same time the capacity of the container is increased.

Both quenching tanks are entirely inclosed with sheet metal hoods and the smoke and steam arising during quenching are exhausted through ducts, being drawn out by suction fans on the roof. The room is ventilated by four exhaust ventilators extending from the ceiling and connected to a fan on the roof. The room is heated by unit heaters; when the windows are closed these supply air to replace that exhausted by the various ventilating units.

Face brick is used for the interior mason work because, with its tile finish, it is easy to clean. The walls are finished in a light tan color which, with the brick trimming, gives the room a bright and neat appearance.

Flexibility Features Plating Facilities

NOT only is the plating department equipped for plating with cadmium, brass, nickel, lead and copper, including plain copper coatings and bronzes, but also for Parkerizing and galvanizing. Chromium plating will be added. The electrolytic process is used for all kinds of plating. In lead plating the company has found that the coating applied electrically is not so porous as when hot dipped and consequently is more satisfactory. Four double-wheel buffing and polishing machines make it possible to meet any polishing specification.

The convenient arrangement of the equipment and the location of the plating barrel driving mechanism are among the interesting features of the plating department. Work starts at the end of the plant adjoining the heat-treating department and is finished at the other end. A floor-type gravity conveyor will be installed shortly for carrying work through the department. This will deliver boxes of finished bolts to an automatic lift, which will discharge them to a gravity conveyor, which will in turn carry them to the packing and shipping department.

The plating tanks are of the double-barreled type arranged lengthwise of the plant in five lines, two for cadmium plating, one for galvanizing, one for special finishes (copper, brass, nickel and lead) and one for Parkerizing. There are 16 tanks and 32 plating barrels. In addition, a sixth line contains large tanks for the still galvanizing, and nickel, copper and cadmium plating of work too long to be handled in the plating barrels.

Shaft Lines Along Floor

Driving shafts for the plating barrels, usually placed overhead, are here located a few inches above the floor. One shaft along the wall drives the barrels in the first line of tanks and the other four lines are driven by two shafts, each located between rows of tanks and driving the barrels in two adjoining lines. There are two washing and pickling tanks, one of each at the head of one line, and these serve the adjoining line in the same bay, a crane with a short runway being provided to deliver work for the second line.

From the end of the crane runway, monorail tracks equipped with electric hoists extend over the tanks the length of the building for handling work in and out of the barrels. Fumes from the pickling and washing tanks are drawn through ducts around the sides at the top of the tank and carried outside the building through a vertical duct leading to the roof, where they are exhausted by a suction fan.

Two rinsing tanks, one for cold water and one for hot water, are located at the end of the line of plating tanks. After rinsing, the bolts are placed in centrifugal driers, one of which is located at the end of each plating line. Here they are dried by a blast of hot air.

Adjoining each drier is an efficient dumping device designed by the company. The circular container that holds the work during drying is placed in a holding fixture on the dumping mechanism and is turned over by a hand-operated spider, bolts being dumped into a chute, from which they pass into shop boxes. Then they are ready to go to the packing and shipping department.

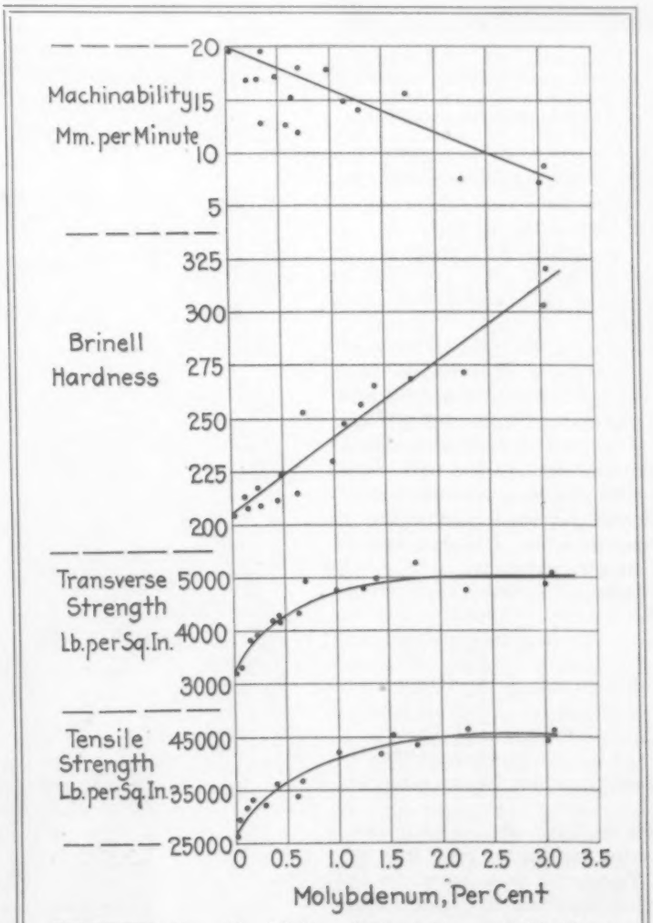
Molybdenum in Cast Iron

Strength and Hardness Increased Much More Rapidly Than Machinability Decreased—Best Results Achieved With 1.5 Per Cent Molybdenum

BY E. K. SMITH AND H. C. AUFDERHAAR*

As usual, steel has led the iron industry in the use of alloys, but recently they have been successfully introduced into gray iron foundries—particularly the use of nickel and nickel with chromium. Other alloys have been tried with varying results, but as yet have not been accorded wide use. One of the most promising of these, molybdenum, has received comparatively little attention in the past, despite its availability from many mines within the United States.

Gillett and Mack, in their recent book "Molybdenum, Cerium, and Related Alloy Steels," state that four alloys are most used in steel making, these being nickel, chromium, vanadium, and manganese; and that the most of these alloys are imported. "The development of a domestic alloying element which can, in whole or in part, replace or supplement these foreign elements, is of obvious importance to American steel makers and users. Molybdenum is such an element. The United States has the largest potential supply of molybdenum ores of any country in the world." Any large metallic deposit is a national asset and this is particularly true of molybdenum. There are a number of deposits, mostly in the Western States. The present price of about one dollar per pound of contained molybdenum restricts the use of this material but it seems very probable that the price can be reduced when molybdenum is used in larger tonnages. Molybdenum has earned a definite and increasingly important place in steel making, and may have an even more essential part in the development of high-test gray irons, especially in case a national emergency should make it difficult to obtain other alloys.



FORTY Crucible Melts of Cast Iron of Uniform Composition, Except for Molybdenum Content, Were Tested by Standard Methods, and the Most Important Data Is Plotted Above

Little Information Now Available

Surprisingly little has been published on the subject of molybdenum in cast iron, although there are numerous articles on molybdenum in steel. In 1920, G. W. Sargent reported improved tensile strength and toughness imparted to gray iron by molybdenum. (a) In 1923, O. Smalley presented data before the Institute of British Foundrymen on special cast iron. (b) He found that molybdenum is valuable as a strengthener, toughener and grain refiner and that up to 0.50 per cent, machinability is not affected. He noted one of the most striking characteristics of molybdenized gray iron, i.e. its strong tendency toward putting graphite into the nodular form.

Piwowarsky, in his notable article on alloys in gray iron, (c) finds increased strength due to molybdenum.

Recently there has been considerable work on molybdenum in cast iron but as yet little has been published.

Data on Crucible Melts

In planning this series of experiments it was desired to follow practical foundry conditions as closely as possible. Preliminary work demonstrated that it was difficult to effect complete solution of high percentages of molybdenum when such additions were made to the ladle. There was also to be considered the small but unavoidable fluctuations in

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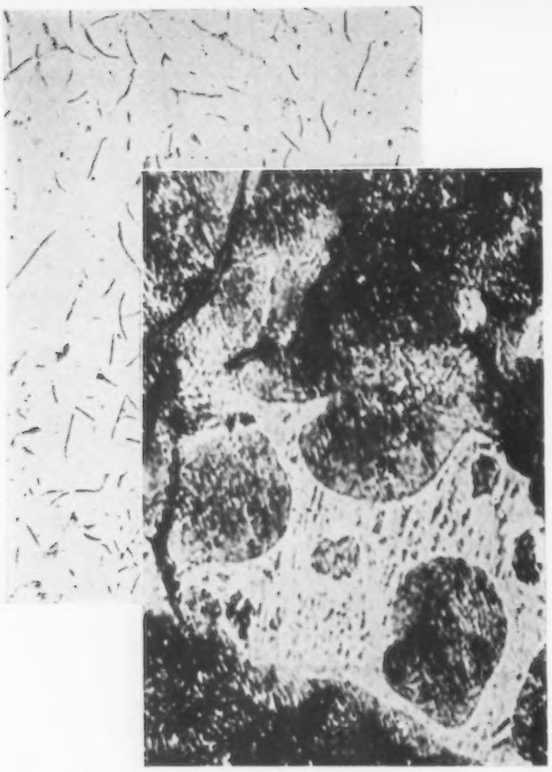
(a) A.S.T.M. *Transactions*, Part 2, 1920, page 5.
(b) O. Smalley, *The Iron Foundry*, supplement to *Metal Industry*, Jan. 19, 1923.
(c) E. Piwowarsky, *Stahl und Eisen*, Feb. 26, 1925, page 294.



STANDARD Cast Iron Containing No Molybdenum. Unetched Micro at 100 Diameters Shows Fine Graphite in Flakes. Etched micro at 500 diameters shows comparatively coarse grains, with graphite, pearlite and phosphide

composition of iron produced by the cupola on a commercial scale. Therefore all charges were melted in crucibles, by which means the usual fluctuations in chemical constituents could be rendered negligible. As a check on the results, molybdenum was added in the ladle, especially in the lower ranges, these results being comparable to those obtained by the crucible melting.

In order to have uniform composition, identical charges were made up for the whole series of crucible heats, forty in number, varying only in the size of molybdenum addition. Cast scrap (42 per cent of each charge) was obtained from one large casting of uniform dimensions, while pig iron (50 per cent) and steel (8 per cent) were from carloads of unusual constancy of composition. Molybdenum was used in two forms, ferromolybdenum and a lower melting point molybdenum alloy. (Calcium molybdate seemed unsuited for these experiments.)

Analysis of test bars was as follows, there being little variation:

	Per Cent
Silicon	2.18
Manganese	0.52
Sulphur	0.060
Phosphorus	0.37
Total Carbon	3.32
Graphitic Carbon	2.67
Combined Carbon	0.65
Molybdenum	According to addition

Gas was used as a fuel, crucibles being carefully covered.

Tension tests were made on bars cast in accordance with the recently recommended pattern for gray iron for pipe flanges and fittings. Transverse tests were run on American Society for Testing Materials arbitration bar. Brinell hardness was determined on the lower end of the arbitration bar.

Machinability Determined by Drilling

In arriving at comparative values for machinability, we used a modified Keep test, it having been found to give satisfactory results in the past. Equipment consisted of a direct-connected, motor-driven drill press travelling at 400 r.p.m. Suitable weights were placed on the press (which was free to move vertically) so that the total weight at the point of the drill was 130 lb. A ⅜-in. high-speed drill was used, care being taken that sharpening between experiments was uniform.

In order to test for machinability, the end of a transverse bar was ground to a depth of ⅛ in. and the drill point rested on the bar, the exact point being located by a center punch. The drill was then operated for one minute, and the depth of the hole measured. Machinability was reported in penetration — millimeters per minute. Duplicate determinations checked closely.

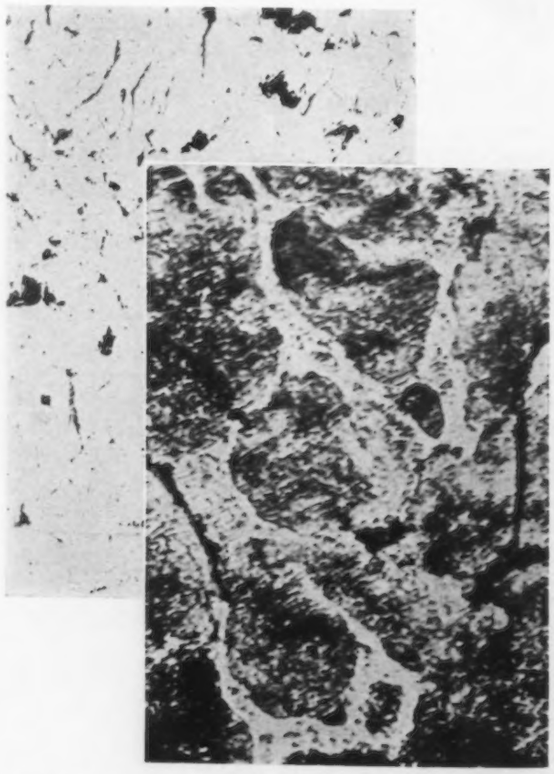
The authors realize that no one test can measure all kinds of machinability, but believe that the drill test gives good average results.

Physical Properties and Structure

Results are summarized on the graph showing the physical properties determined and by the micrographs showing the structure. Owing to the method of melting the variations, which are reasonably consistent, may be ascribed primarily to the influence of molybdenum.

Machinability.—Increasing percentages of molybdenum decrease machinability, as measured by the drill press. However, machining did not become notably difficult, until molybdenum had reached 1.5 per cent, which point also marked the attainment of maximum strength. At 3 per cent molybdenum, drilling was difficult. A bar, not shown in graph, with 4.40 per cent molybdenum, could not be drilled.

Brinell Hardness.—Molybdenum hardens cast iron, even in small amounts, but apparently hardness increases more rapidly than machinability decreases. At maximum strength, with 1.5 per cent alloying metal, the Brinell



STANDARD Cast Iron Containing 0.65 Per Cent Molybdenum. Unetched micro at 100 diameters shows large nodular graphite. Etched micro at 500 diameters shows a somewhat finer grain than the iron without molybdenum. Constituents are phosphide, graphite and pearlite

number was about 260, but the bar could be readily drilled. A bar with 4.40 per cent molybdenum showed 418 Brinell, and could not be drilled.

Transverse Strength.—Starting with unalloyed bars having transverse strength of 3200 lb. per sq. in., strength increased rapidly, reaching a maximum of 5000 lb. per sq. in. with 1.5 per cent alloy.

Tensile Strength.—Results on tensile bars plotted in a similar curve to that for transverse strength, a maximum of 45,000 lb. per sq. in. being found with 1.5 per cent molybdenum.

The micrographs, both etched and unetched, explain the effect of molybdenum on the physical properties of cast iron. In the first place, the usual long, heavy plates of graphite are absent, and most of the carbon is in the from of nodules. This naturally strengthens the iron. Very fine pearlite or sorbito-pearlite, induced by the alloy, also tends towards strength.

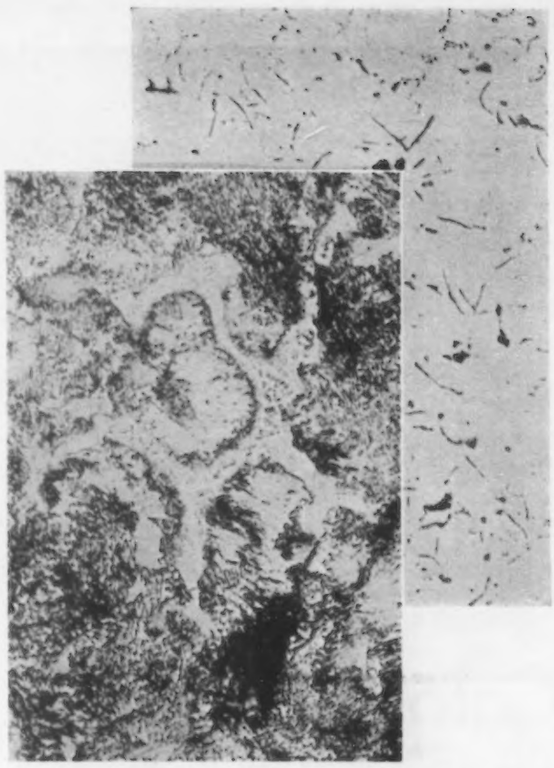
The fact that the molybdenum to a great extent is in solid solution in the ferrite toughens the matrix, promotes shock-resistance, and also inhibits grain growth.

Both the solid solution and the sorbitic structure harden the cast iron, as shown by Brinell tests, and in the higher ranges of molybdenum, make the castings less machinable.

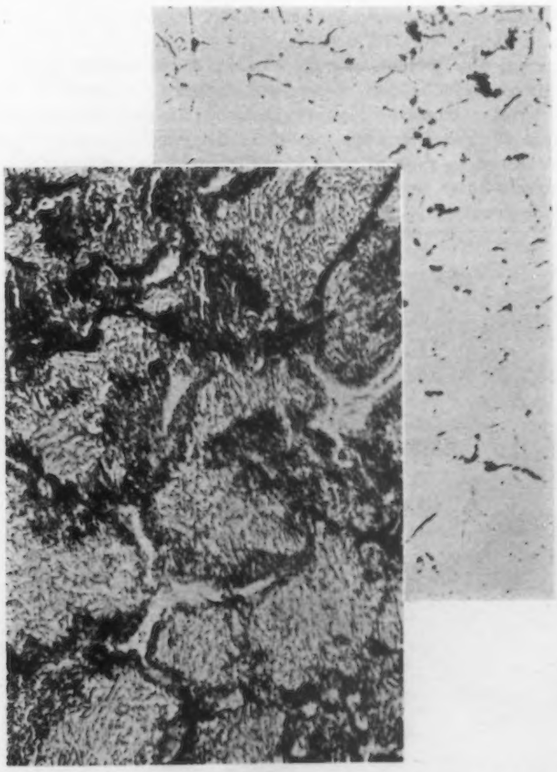
Increasing hardness of the iron is not due to increase in carbides, as there is little increase in combined carbon shown by analysis, and by microstructure. This absence of excess carbide, coupled with the strengthened matrix, also helps to account for the high resistance to shock.

Practical Conclusions

Molybdenum is far from being a remedy for all foundry troubles, but as a strengthener it has a definite use, especially where low costs are not of primary importance. With molybdenum at one dollar a contained pound, two per cent added to cast iron would add about $40 per ton to the cost, the tensile strength being increased from 26,000 to 45,000 lb. per sq. in. An addition of one per cent will raise the strength from 26,000 to 40,000 lb. per sq. in., at a cost of $20 per ton. Obviously, the increased strength would permit lighter sections.



STANDARD Cast Iron Containing 1.77 Per Cent Molybdenum. Unetched micro at 100 diameters shows flake and nodular graphite. Etched micro at 500 diameters shows that increasing amounts of molybdenum progressively refine the grain. Structure comprises a small amount of graphite, very fine pearlite tending toward sorbite, and phosphide



STANDARD Cast Iron Containing 3.10 Per Cent Molybdenum. Almost all the graphite is in nodules; the grain size is small, and the pearlite tends strongly toward sorbite

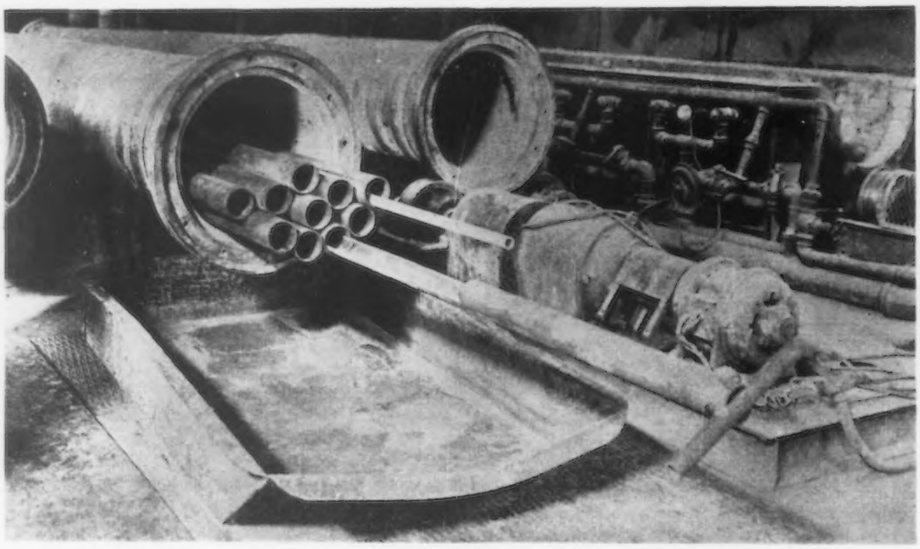
The statement has been made that molybdenum acts as a desulphurizer. The present experiments gave evidence of no such action, although at first the addition of alloy apparently reduced sulphur. This effect seemed to be due to an interference with the usual analytical methods.

A limited number of impact tests indicated that iron containing 1.77 per cent molybdenum had almost double the shock resistance of the unalloyed iron. It seems probable that this property of molybdenum bearing cast irons will prove of value.

Preliminary experiments also indicated that small percentages of molybdenum have little effect on the growth under repeated heatings, or on scaling.

Maximum values for transverse strength at 5000 lb. per sq. in., and for tensile strength at 45,000 lb. per sq. in. were found, but it is obvious that these values hold only for the type of cast iron used. By changing the other elements such as carbon and silicon, higher strengths could undoubtedly be obtained.

In summary, the results of our experiments show that moderate amounts of molybdenum have a beneficial effect on the physical properties of cast iron, but the increased cost is a detriment. However, where decreased weight, increased strength, or shock resistance are important, molybdenum can be used to decided advantage.



SEAMLESS Tubes are Loaded Into Retort. Calorizing compound is then placed uniformly inside each tube by means of the split pipe, and a small diameter pipe placed in each tube to prevent the charge from moving endwise and leaving some portions bare. Compound is also placed in channels between tubes

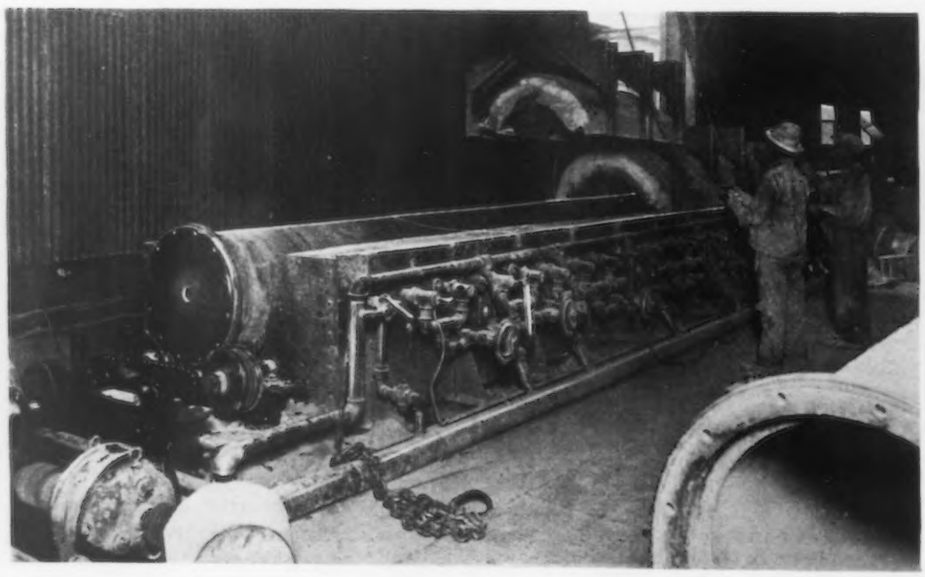
Calorizing Tubes to Resist Corrosion

Rotating Retort Contains Steel Tubes, Granular Aluminum and Hydrogen Atmosphere—Alloy Forms on Surface Which Resists Oxygen and Sulphur

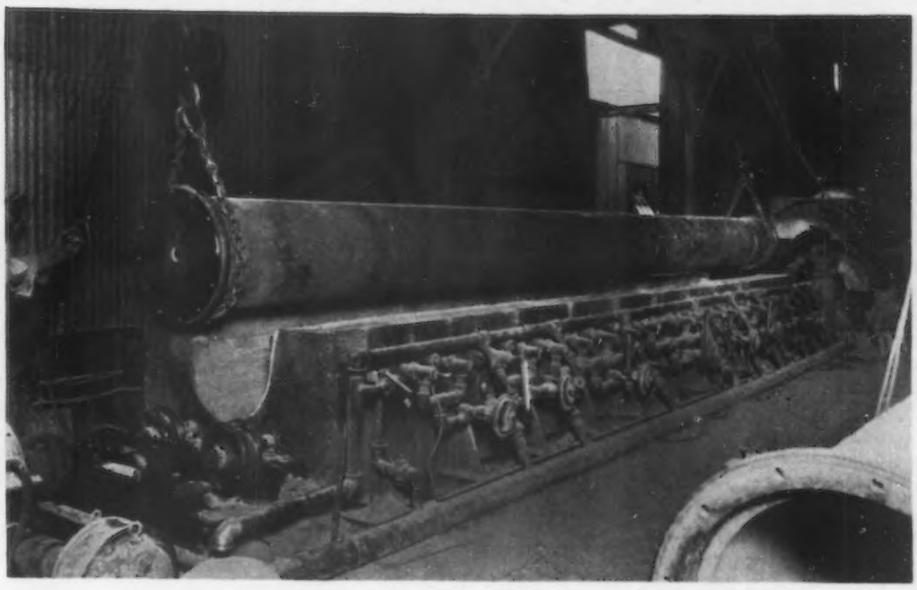
BY B. J. SAYLES*

CALORIZING, as is well known, is a process whereby aluminum is driven into the surface of another metal, usually mild steel, to form an aluminum alloy. This alloy, where mild steel is the base metal, is practically immune to oxidation up to maximum temperatures of 1650 deg. Fahr., and entirely resistant to the corrosive attack of gaseous sulphur products. The process has thus extended the use of an inexpensive construction material to operations in which it could not previously be successfully employed.

*President, Calorizing Co., Wilkinsburg, Pa.



FURNACE Top Consists of Series of Bungs. After assembling, joints are patched, and uniform temperature given to work by series of gas burners. Heat and reducing atmosphere closely controlled at all times



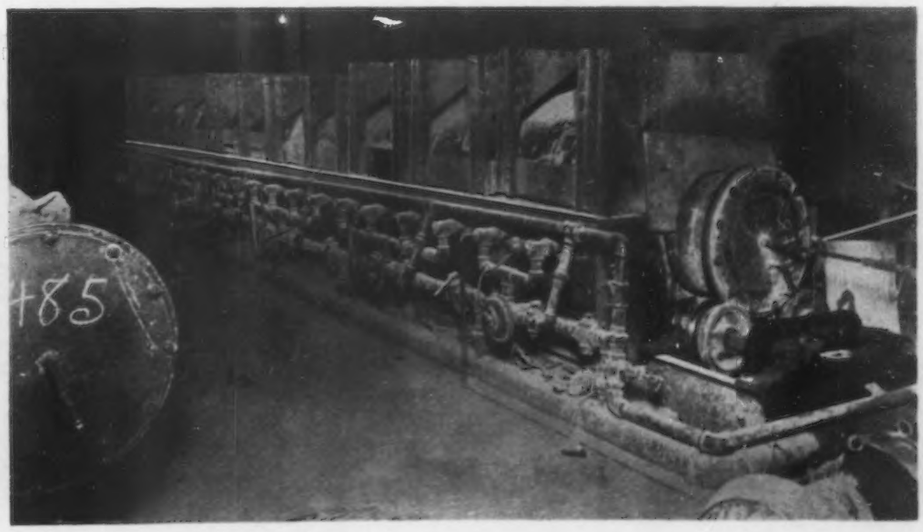
LOADED Retort Has Ends Tightly Bolted On, and Is Lowered Into Furnace Casing. End flanges engage rollers, one pair driven, another pair idling, and retort turns slowly while under heat

One of the major applications of calorizing is for processing seamless steel tubes for oil stills. Even when such equipment is designed to operate on petroleum products at comparatively mild temperatures—say 750 deg. Fahr.—the reactions going on in the fluid cause the deposition of more or less petroleum coke. This prevents the normal heat flow from the furnace gases to the petroleum, the same as boiler scale cuts down the efficiency of a steam boiler. A more serious consideration is that the temperature of the outside of the tubes rises, gradually approaching the temperature of the products of combustion, to a degree where bare iron or steel scales rapidly.

Another factor which weakens oil still equipment is internal corrosion by sulphur-bearing compounds. In combating this latter difficulty two methods have been in vogue. The equipment may be built extra heavy, providing sufficient metal thickness to withstand corrosion for an extended period, or the oil may be treated to neutralize its corrosive elements. Both of these expedients are costly and only partially effective. Sulphur corrosion is especially active at temperatures above 700 deg. Fahr., so that still tubes are invariably subjected to severe attack and rapid destruction.

When this combination of external oxidation and internal corrosion has substantially reduced the wall thickness of an ordinary steel or iron tube, it usually swells in diameter, there being insufficient steel to resist the internal pressure. Reduction of the wall to the danger point is therefore first evidenced by swelling, but there is no assurance that the swelling will be detected in time to permit replacement before rupture occurs.

From the foregoing it is apparent that calorizing serves a dual purpose on cracking-still tubes, rendering the interior immune to sulphur corrosion while the exterior is protected from oxidation. In calorizing the aluminum is driven into the surface layer of the steel forming an iron-



ATMOSPHERE of Hydrogen Maintained in Retort; Gas Enters Through Pipe at Center of End Plate. Calorizing requires 5 hr. at 1740 deg. Fahr. Entire cycle takes 11 hr.

aluminum alloy, an integral part of the steel, which resists both oxidation and corrosion. The alloy surface is much harder than mild steel and under the action of the tube cleaner assumes a high polish.

Cracking-still tubes to be calorized are preferably specified to be cold drawn under American Society of Mechanical Engineers Specifications, hot pickled after annealing at the mill to remove scale. The steel as delivered is also thoroughly sandblasted and wire brushed to provide a smooth, clean surface. The tubes are then placed in a cylindrical retort and packed in an aluminum compound which is uniformly distributed over both the interior and exterior surface of the steel. The illustration shows a pipe split down its center for introducing powdered compound into the tube, uniformly from end to end. The heads of the retorts are then bolted on and hermetically sealed, a hydrogen atmosphere being maintained during the entire subsequent process.

Calorizing retorts shown in the illustrations are 24½-in. outside diameter, 30 or 35 ft. long. Four furnaces are provided, approximately 35 ft. long by 5 ft. wide by 6 ft. high, designed and built by Surface Combustion Co. of Toledo, Ohio. The shell of the furnace is a cylindrical steel plate lined with 9 in. of fire brick.

Tops or bungs are removable in 3 ft. and 6 ft. sections. Tops are lined with 2½ in. of Sil-o-cel and 9 in. of fire brick, and are carried in a steel frame. The lower part of the furnace is also sectionalized and bound together by a structural steel frame.

A base carrying chilled iron rollers is located at either end of the casing; retorts rest on flanges bearing on these rollers. Rollers at one end are driven by a 5-hp. motor through speed reduction gears to permit rotation at speeds varying from 1 to 3 r.p.m. Rollers at the opposite end of the furnace are idlers.

Each furnace is fired with 23 Surface Combustion burners for natural gas located on one side. There are seven thermocouples protruding into each combustion chamber and these are connected with an indicating switchboard type pyrometer, so that the temperature at any point may be accurately checked at convenient intervals. Gas burners are manifolded to inspirators by which the proper gas-air mixture for complete combustion is maintained. Any furnace atmosphere may be had with this system, but in this application a neutral atmosphere is vital to minimize scaling of the retorts at the operating temperature of 1740 deg. Fahr.

It requires from 4 to 4½ hr. to bring the retort and furnace up to operating temperature; gas consumption for this and the 5-hr. soaking period is about 33,000 cu. ft. A charge in the 35-ft. retort will include 3750 lb. of steel, 3000 lb. of calorizing compound which, with the 11,000-lb. retort, makes a furnace charge of 17,750 lb. After shutting off the gas it takes 2 hr. for the retort to cool black.

German Version of Birth of Stainless Steel

BY DR. PHIL. H. SCHOTTKY*

IT was a peculiar coincidence that in 1912 the most useful of the non-rusting steels was just being baptized, while a noted authority on special steels was publishing in his handbook the following statement:

> The question of the rust-resistance of certain special steels has been insufficiently studied. Still, everything points to the fact that there is no alloy of iron which will withstand the attack of rust.

Many a scientific prediction is later contradicted, for to err is human, and science is of human origin. However, in this case, the contradiction followed close upon the heels of the prediction. Corrosion problems had been under investigation in the Krupp laboratories at Essen since 1909. Two men, of quite different nature, were joined in the common pursuit: Professor Strauss, physicist, hearty in spirit and tireless in his search for improvement, and his assistant, Dr. Maurer, metallurgist, slow, yet temperamental, profoundly absorbed in his scientific thoughts. He was fresh from Paris, where he recently completed an outstanding research under the great Osmond.

At the same time as, but independently of, the study of rust-resistance, Professor Strauss had begun investigations on heat-resisting alloys, which were to serve as protecting tubes for pyrometers. Two high-chromium and three high-nickel, high-chromium steels were prepared for this purpose. It was then noticed that a piece of the steel remained bright in the air of the laboratory for months, while nickel itself was quickly attacked. Such a fortunate discovery, bridging the gap between two independent investigations, was, of course, a tremendous spur, for here at hand was an alloy steel which behaved like a noble metal. Such was the ancient goal of the alchemists, who were wrecked by its impossibility. Rarely was it permitted them to find something useful along the way—although, according to tradition, Johann Friederich Vöttger discovered the process of making porcelain in the effort to produce gold.

People were more reasonable perhaps in the scientific nineteenth century. Still, from its beginnings, from the production of crucible steels by Alfred and Friedrich Krupp, the company had always been devoted to the building up from raw materials of finished and semi-finished products of every description. It lay, therefore, in the Krupp tradition to supply an alloy, containing 75 per cent of cheap, base metals, which had the enduring properties of a noble metal.

A similar steel had already been produced by the Frenchman, Guillet, who, however, was unable to forge it. This Krupp was able to do, and for this reason the Krupp building where the first crucible melts were made has come to be known as the source of the "noble" steels.

The goal of practical utility was still far from reached. The mechanical division, which was to prepare tensile specimens, returned the steels to Professor Strauss as unworkable. In fact, it resisted every effort to turn it down in a lathe and broke on bending, with a brittle crystalline fracture. Heat treatment seemed the only answer, but no information was available for selection of the proper procedure. This delayed the "birthday party" of V2A steel for several months.

The correct treatment was finally found through scientific knowledge of the special properties of this non-magnetic steel—by quenching from 1100 or 1200 deg. C., in oil or water, the metal was rendered tough and relatively easy to work. Physical tests showed favorable values for tensile strength, ductility and toughness, while corrosion tests showed it to be superior to any other ferrous alloy. A large, smooth-turned cylinder, which is today on exhibition at the Krupp laboratories, had hung in the open, half under water, for months, without showing a trace of rust or a dimming of the nickel-like surface.

The V2A steel, as a useful alloy, was thus born, as is evidenced by the German patent, and if the reader wonders at its strange and somewhat mysterious name, let him learn that V2 signifies "test steel (Versuchstahl) No. 2," and that A denotes its austenitic character.

*From an article in *Monatshefte*, published by the Krupp company, Essen, Germany.

Development of Upset Forgings

Saving of One-Fifth in Weight and Great Improvement in Output—Uniform Grain Conditions Give Higher Strength

BY WILLIAM E. CROCOMBE*

PRACTICALLY a new process of forging, known as upset forging, has been developed to such an extent during the past five years that present output approximates 350,000 tons yearly. This estimate covers only commercial and automotive forgings; other types of forgings such as rivets, bolts, nuts and miscellaneous railroad car forgings (hangers, knuckle pins, air brake pins and coupler yokes) make up a total far in excess of that mentioned. This method of forging has decreased the amount of steel actually consumed by producers about 70,000 tons—a really great saving. The estimate for all types of upset forgings shows a 20 per cent saving in weight compared with hammer, hydraulic, or other methods of forging.

The upset forging machine has been one of the most important factors in the tremendous increase of automobile production, and has been a vital factor in the decrease of cost. This has been brought about not only by the saving of material entering into the forging itself, but also by the great increase in production over other forging methods.

Much Greater Production Obtained

I remember producing steering worms for the old Mitchell car in 1912 on a 3500-lb. steam hammer at the rate of 250 in a 9-hr. day. This forging, produced in a rolling die, had approximately 10 to 12 deg. draft. Its weight of about 20 lb. did not include the tong end, which was later cut off the forging and thrown away.

*President, American Forge Co., Chicago.

Present methods produce the same type forging on a 4-in. upsetter at a rate of 1200 in a 9-hr. day, and the finished weight of the same forging is 14 lb.—a saving of 30 per cent in steel and an increase of 380 per cent in production. This same story applies in even greater measure to main drive gears and cluster gears. The increase in production on main drive gears averages over 700 per cent and on cluster gears from 500 to 600 per cent.

Upset Method Eliminates Tong Holds

Another great saving in the upset method of forging is the elimination of flash and tong holds. This is accounted for by the difference in die construction and design. Hammer dies are made in two parts—the top die and the bottom die—and it is necessary to have the proper amount of draft, or taper, to remove the forging from the dies. This draft varies from 3 to 12 deg., differing with the design of the forging.

By contrast, the new forging machine die opens in three parts: a moving die, a stationary die, and the heading tools. The operator places the stock in the stationary dies and steps on the treadle, bringing the moving die over in direct line and gripping the stock. The headers then come in and do the necessary upsetting or forging operation, then return to their original position, leaving the finished forging in the stationary die. Neither draft nor taper is required for the operator to release the forging. In recent years new developments in upset forgings include the production of irregular designs requiring a trimming operation to remove flash, and this operation is

Bars Are Cut to Exact Multiples of the Metal Needed for a Given Forging. A bar end is heated and forged. The forged end is removed by a hot saw and the cut end of the bar is then reheated preparatory to continued forging

generally finished in the same die and same heat, eliminating the need of a trimming press.

Piercing of holes, or displacing of metal, in upset forgings has been an important factor in the reduction of cost to the consumer. No doubt the piercing of holes by the upset forging method saves the consumer not only considerable money in raw material, but also the cost of removing additional metal by either lathe or drilling operations. On large holes, 1½ in. in diameter and larger, material should be displaced, or pierced, but with enough tolerance allowed the forging manufacturer so that his production will not be impaired.

It should be remembered that in the piercing of upset forging smaller size stock must be used, increasing the number of passes, or operations, necessary to complete the forging. On the larger size holes the body of the punch is heavy enough to withstand the heat in the constant production of forgings, and the holes are fairly uniform. We have never been able, however, to maintain a perfect hole. By this we mean that constant production day after day will show some variation, 1/32 in. off to one side, then to the other.

It was our thought that improper heating caused this variation, thinking the punch would follow along the lines of least resistance, and in case a bar was not heated perfectly the punch would run to the hottest side of the forging. In a test, however, of a brand new machine (with new dies) and the bars all heated in an electric furnace, we still found a variation, amounting to 1/32 in. maximum. But it should be remembered that everything was new and in perfect condition. With older dies and equipment we have found our average variation from concentricity to be 1/32 to 1/16 in. This variance, with proper allowance for finish on the outside diameter, does not interfere with high-speed finishing production, and the saving in material and drilling time is highly desirable.

Design Shows Whether to Pierce

On small holes, 1½ in. and under, the design of the forging has much to do with the advisability of piercing. On a straight forging, with a perfectly plain outside diameter, we have gone to a 1-in. hole with no difficulty. But on certain types of gears, cluster gears for example, with three gears on one forging, we find it impossible to produce these parts economically with holes. These forgings, which vary in length from 5 to 8 in., generally have a finished hole either 1 in. or 1⅛ in. in diameter.

We found on this class of work that our die expense was increased 300 per cent and our production decreased to one-fifth. The increased die cost was caused by more passes and high-cost material for punches. Decreased production was brought about by the absolute necessity for perfect holes, and in case one punch bent or broke, the holes were off center, requiring a new set-up.

We discovered, after working this problem out with our customer, that we were trying to eliminate a drilling operation on these gears where the saving in material amounted to slightly over a pound, and one man on a multiple-spindle drill could drill and broach in one day more than our entire daily production of solid forgings. We were trying to compete, on equipment valued at considerably more than $50,000, including a forging machine, furnaces, motors, with a crew of four men, against a multiple drill and one man. Covering a period of two months, our average running production time on these gears pierced was 18 per cent, 82 per cent of the time we were down for machinery adjustments. Rejected forgings totaled 31 per cent. On the same gear made solid our production time was 94 per cent and rejected forgings 1.2 per cent.

While practically all metallurgical engineers insist on upset forgings in gear work, not only for additional strength on account of uniform grain flow, but on account of increased density that eliminates warpage or distortion in heat treating, the layman sometimes is at a loss to understand the changes which have been brought about in this method of forging. The increased strength in upset forgings was brought home forcibly in our organization last year.

We had a job that called for delivery of 7000 pieces a day—a very intricate job, which had six prongs running into the header about 1½ in. in depth. We tried every known die steel, and our average life on these dies amounted to 1200 to 1500 forgings. Four headers on one machine were split in one day and immediate action on our part was required to keep up production schedules. These headers were 8½ in. in diameter and were made of hammer-forged alloy steel.

A set of dies was designed to produce the same header forging from a 4½-in. round. It required 28 in. of this size stock to produce the headers, and to our great surprise the first one of these upset headers produced 26,000 forgings, and the largest run on the upset headers amounted to 37,000 forgings, from exactly the same quality steel as furnished in the hammered forgings.

From our experience in making and quoting on thousands of different designs of upset forgings, we believe the consumer would save not only on upset work, but on hammer work as well, if he called on competent forging experts to go over new designs, with the idea in mind of simplifying die construction and increasing actual production. On cluster gear production, the addition of ¼ in. in spacing between gears results in increased production of 30 to 40 per cent, with a corresponding decrease in die expense on forgings of this type.

On certain types of gears with a 1-in. finished space between gears, the forging must be finished 13/16 in. at that point to have necessary stock for finishing. This means that an insert as large as 8 in. in diameter must take the entire thrust in finishing the forging. Rapid production on gears of this type heats these inserts in spite of all methods of cooling, causing them to bend, making it necessary to stop production and so tying up expensive machinery to change the die equipment.

The addition of only ¼ in. in the spacing between gears allows a much stronger die to be designed, resulting in increased die life and increased production, all of which reflects back to the customer in lower prices.

After parts have been released for production, small changes are often impossible to make on account of adjacent component castings and gears, all of which must be redesigned to agree with the change on one gear.

Another factor in designing that causes considerable grief to all forging concerns is the use of very thin sections. We have found in our practice that, on forgings requiring a thickness of less than ⅜ in., it is necessary to set our headers flush with the dies, letting the spring of the bed casting produce the desired thickness. This method, of course, is dangerous. Production of forgings having a flange in excess of 5 in. in diameter and under ⅜ in. in thickness we believe to be impractical on upsetting machines, due to the tremendous strain put on the bed casting and crankshafts.

How the Large Demand Grew

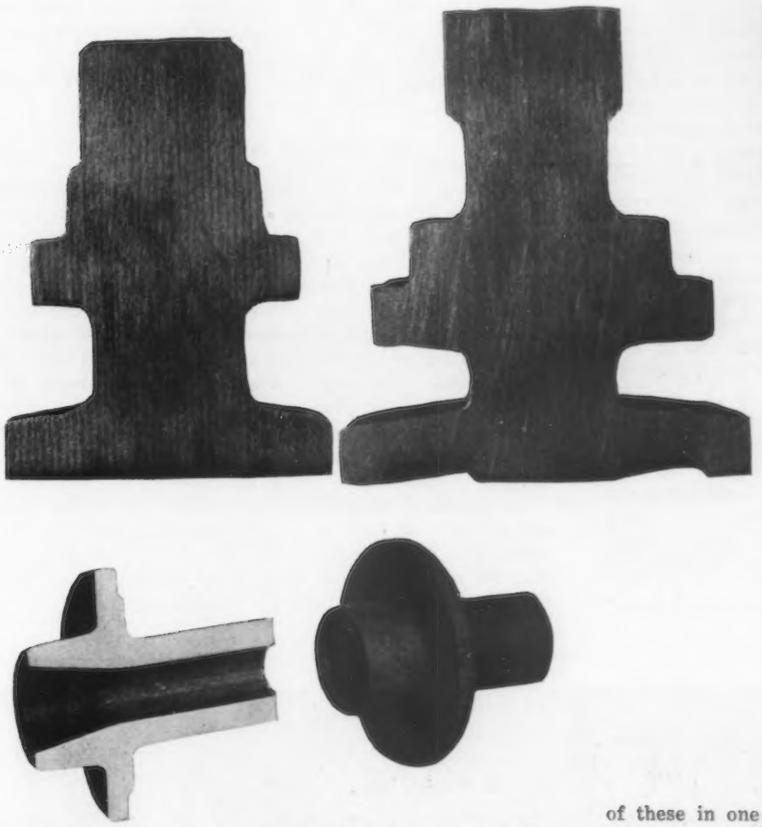
The first real demand for drop forgings came from the bicycle industry, and after the advent of the automotive industry the demand for forgings became so great that forge plants were unable to meet it. This led the larger automobile companies to install their own forging equipment as an insurance against delays in deliveries on their specifications. Thence came excess capacity, and after several periods of depression the World War created such a demand for forgings that perhaps no one industry in the entire country expanded so rapidly. The post-war period in the forging industry left a trail of bankruptcy, and

probably no line of business suffered so heavily from ruthless price cutting and keen competition.

As in all trade conditions of this kind, after a period of four years of practically no profits, the remaining forging concerns looked forward to better times, as hundreds of hammers and other forging equipment were forced out of the market. Bargain prices on this second-hand equipment led some buyers of our products to believe that forgings could be made cheaper in their own plants. Hence much of this old and obsolete equipment was sold and set up in competition with modern equipment, up-to-date plants and first-class forging organizations.

Plea for Adequate Cost Analysis

I have never been able to understand the installation of forging equipment in plants not consuming tonnage enough to warrant the organization necessary to produce forging on a competitive basis. Not enough time or study is put into the proposition until after the equipment is installed, and then eyes are closed to the constant loss of money. Charges that should be made direct against the forging department are made against general overhead, and no proper basis of outside competition can be arrived at.



This Upset Forging Was Made from a 3-in. Bar. The pierced hole is 1½ in. in diameter. The rim of the flange is ⅜ in. thick and the diameter of the flange is 7⅛ in.

Some producers would get quite a shock, I am sure, if the total of steel cost, actual labor, die expense, fuel cost, repair expense and power were prorated over the forgings actually produced, and then compared with competitive figures obtained from modern forging plants.

In our business the steel cost alone on certain types of forgings often runs from 65 to 70 per cent of the selling price, leaving so small a fabricating margin that only high and constant production with high-speed and efficient organizations, not only in the forge shop, but the die department as well, can show a profit.

One of our associated companies has had an experience of this kind in connection with the production of bolts and rivets. All told, we probably produce in our eight plants throughout the country 60,000 tons of miscellaneous hammer and upset forgings yearly, and we all thought we were pretty well up on all types of forgings. We discovered we had seven different bolt and rivet machines in various sections. The thought occurred to group all of these in one section and produce all forgings of this type in one plant.

ETCHED Cross-Section of an Upset Gear Forging (Above). Note that the grain is parallel to the axis of the bar and also parallel to the rim of the gear blank at the point where the teeth are to be cut

* * *

PERFECTLY Designed Cluster Gear Forging (Extreme Left) for High-Speed Forging Production, Long Die Life, High Production and Fast Machining. At its right is an incorrectly designed cluster gear forging. Note the narrow spacing at neck of forging, resulting in shorter die life, lower production and slower machining

Upon impartial investigation we discovered that, even upon grouping these units, our cost on this particular product was much higher than the price for which the same commodity could be purchased in the outside market. This discovery resulted in shutting down all the rivet and bolt machines in our plants, saving the company thousands of dollars yearly.

Abandoning One Type of Product

Our investigation of this proposed change brought out the interesting fact that, in connection with the installation of all of these units under one roof, with the necessary buildings, new foundations, die equipment, heat-treating equipment, shear equipment, oil storage, steel storage, steel handling equipment and furnaces, the interest on our investment, not including machines, amounted to over $12,000 annually, and this figure alone can certainly purchase a great quantity of bolts and rivets. The same is true of other types of forgings and castings.

Conveyors and Ovens for Large Cores

Both Continuous and Batch Units in Same Plant Make Comparison Easy— Handling Costs Reduced

BY J. B. NEALEY*

PRINCIPAL operations in the manufacture of radiators and boilers are making and baking cores, and molding and casting. The foundry at the Bond plant of the American Radiator Co. at Buffalo uses mass production based on straight-line mechanical methods. Molding, pouring and shakeout all center around continuous closed-loop roller conveyors. All materials to and from these units are handled on roller conveyors, also.

The core-making section has been equipped with conveyors, ovens and machines, arranged so as to synchronize the two operations of making and baking. This establishes a definite time schedule in this department and permits very close control.

Four of the core ovens are continuous and automatic in operation and two of them are identical in construction and dimensions. Each oven is served by two jolt, rollover core-making machines, located side by side and in front of the oven. Cores made up on plates are transferred directly from one machine on to oven trays on the charging table. Cores and plates from the other machine are transferred directly on to a second charging table, from which they are lifted and set down on top of the cores and plates from the first machine, the top plate being supported above the lower by four cast iron pegs. These are then loaded on to the shelves of the oven conveyor.

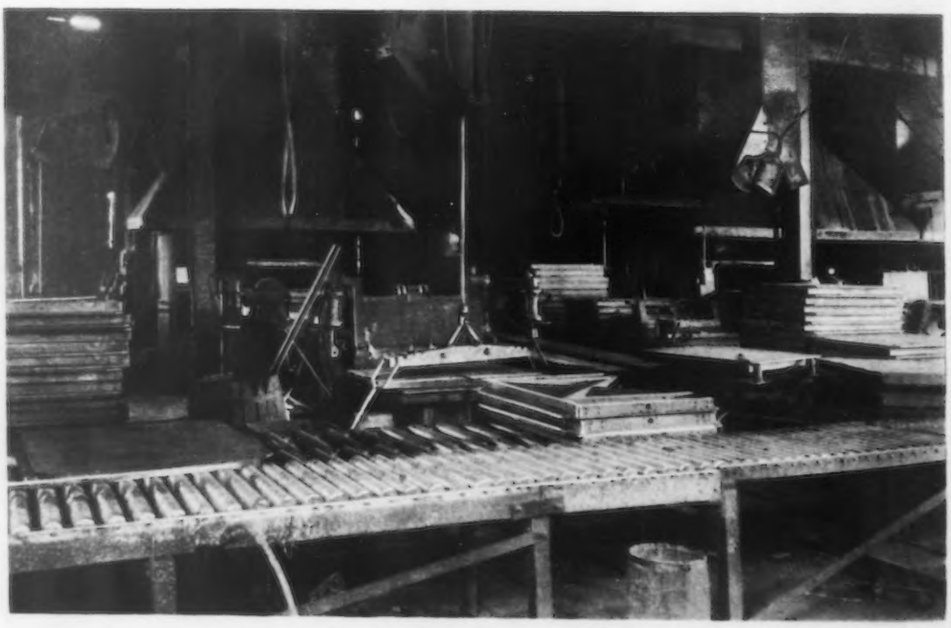
Built of steel, its walls filled with 4 in. of insulation, the oven is 74 ft. 6 in. long, 7 ft. 8 in. wide and 19 ft. high. The motor-driven conveyor consists of two endless chains supporting a series of shelves carried through the oven, returning at the top, with discharge at the charging end. There are 279 ft. of link chain weighing 13 lb. to the foot and supporting 62 carriers or shelves. Each shelf weighs about 96 lb., and hangs down 12 in.

Two Unequal Burners Used

Heating is with gas and in the following manner: Two ducts for distributing combustion and recirculated products are installed in the bottom and run lengthwise of the oven. Ports in these ducts are so spaced as to distribute the heat evenly throughout the length of the oven. In one end of each distributing duct are one large velocity-type high-pressure burner and one small velocity burner, firing at an angle to the large one and into the same tunnel. The small burner is always operated and serves to hold the oven to temperature when no work is going through, and as a pilot light for the large burner. The large burner, connected to the automatic temperature control, is used while baking the cores.

A specially arranged firing tunnel and firing head are utilized, so that the combustion products from the tunnel are immediately mixed with recirculating gases, thus to decrease their temperature before being discharged into the oven from the distributing ducts.

*American Gas Association, 420 Lexington Avenue, New York.



CHARGING End of Ovens, Core-Making Machines and Conveyors Which Carry the Baked Cores and Return the Plates to the Oven Crew. Note pneumatic clamps on core-making machine at left, sand chutes over core-making machines and air lifts for handling plates

CHARGING End of One Oven, (at left side) with Conveyor. Return Loop from discharge is seen in extreme left background. At right center is return loop of discharge conveyor from other oven. Air is blown over the baked cores, to cool them so they can be handled by the time they have traveled to end of conveyor. Oven at left has a longer discharge conveyor, so that artificial cooling is not needed

Gases are taken off at a desirable point in the oven by a recirculating fan, which serves not only to return the gases, but also to pull in a certain amount of fresh air for proper oxidation of the cores. The remaining combustion gases are discharged from the oven through various openings.

Discharged Cores Move by Gravity

Baked cores as discharged from the unit are moved by gravity on roller conveyors to the front of the oven. Here the cores are shifted to a second conveyor, where they are inspected, pasted together, wired and then sent to storage. The plates are left on the conveyor and returned to the core-making machine, the transfer being made by an air lift.

Vecto heater cores are baked in a bank of four stationary gas-fired ovens, built of brick, 16½ ft. long, 10 ft. wide and 8 ft. high. Shallow pits underneath carry two manifolds, each supplying gas fuel to five burners, firing through the grating of the floor. These are used in conjunction with inspirators for exactly proportioning the gas-air mixture for perfect combustion and the correct oven atmosphere. Secondary air is admitted through vents in the rear setting, while six flues, three on each side, and located about 10 in. above the floor, are provided for exhausting the products of combustion.

The cores are rammed up in special core-making machines, and are loaded on to steel rack stands with the aid of pneumatic hoists. Owing to the dry sand binder, cores are charged into the ovens as quickly as possible, by electric trucks with high-lift platforms.

Each oven is charged with six racks and the burners are operated wide open (6-in. water) until a temperature of 380 deg. Fahr. is attained. One row of burners is then shut off and the temperature is maintained with the remaining manifold, until the work is discharged. This minimizes the time required to bring a cold charge up to temperature.

Comparative Tests of Differing Ovens

Two types of ovens in the same plant, operating on the same fuel and the same kind of work, afford a basis for comparative tests, from which valuable operating data have been obtained.

For every pound of cores put through continuous core oven there is at the same time included 1.84 lb. of steel. The gas consumption per 100 lb. of cores and steel is 16.2 cu. ft. The efficiency calculation based on 100 lb. of charge would be as follows:

B.t.u. of gas = 850
Charge = 35.2 lb. of cores plus 64.8 lb. of steel
Specific heat of steel = 0.127
Specific heat of sand = 0.195
Oven temperature = 450 deg.
Atmospheric temperature = 60 deg.
Temperature rise = 450—60 = 390 deg.
Heat in steel = 64.8 lb. × 390 × 0.127 = 3209 B.t.u.
Heat in sand = 35.2 lb. × 390 × 0.195 = 2676 B.t.u.

Total heat for 100-lb. charge = 5885 B.t.u.
Gas consumption = 16.2 cu. ft.

$$\text{Efficiency} = \frac{5885}{16.2 \times 850} = 42.7 \text{ per cent.}$$

Compared to this, on the batch oven for each 100 lb. of charge there are 57.8 lb. of cores plus 42.2 lb of steel.

Temperature of operation = 350 deg.
Atmospheric temperature = 60 deg.
Rise in temperature = 350—60 = 290 deg.
Heat in steel = 42.2 lb. × 0.127 × 290 = 1553 B.t.u.
Heat in sand = 57.8 lb. × 0.195 × 290 = 3268 B.t.u.

Total heat for 100-lb. charge = 4821 B.t.u.
Gas consumption = 22 cu. ft.

$$\text{Efficiency} = \frac{4821}{22 \times 850} = 25.8 \text{ per cent}$$

Continuous Ovens More Efficient Than Batch Ovens

From the test data one can see that the continuous oven is much more efficient than the batch type. Should the same proportion of steel and sand be used in the batch type oven, and operated at the same temperature as the continuous oven, instead of 22 cu. ft. for 100 lb. gross, there probably would be required around 35 cu. ft. This considerable difference in efficiency readily recommends the use of the continuous oven, from the standpoint of fuel consumption alone.

In addition to the lower fuel costs with the use of the continuous oven, operating expense and several other costs are reduced materially. A cut in labor cost through decreased handling results from the traveling conveyor systems. Indeed, for a sufficient number of periodic-type ovens to handle a production equal to that of one continuous oven, there would, perhaps, be required twice as many men for material handling. In addition, with

Core in Foreground Is Ready to Be Wired Together, Which Is the Last Operation

a large number of batch-type ovens, there is considerable truck expense necessarily involved in material handling.

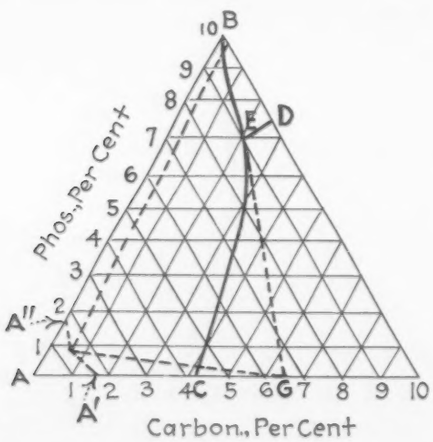
Better Costs Obtainable from Synchronized Work in the Oven

There is a further decrease in labor cost in coremaking when the various operations center along a continuous handling system. The speed of this part of the foundry is synchronized with that of the traveling conveyor in the oven. Of course the capacity of the oven and speed of the conveyor are designed to coordinate with the most efficient speed of the core makers. Considerable flexibility in the speed and capacity of the oven allows for variations in production rate, including making the cores, cleaning them, pasting halves together, blackening, etc., before the core is ready to deliver to the molder and to enter the production line.

Greater uniformity of temperature obtained with a continuous oven results in more uniform cores. With the continuous oven every core passes through each zone of heating, so, if there is a possibility of non-uniform distribution of heat in any part of the oven, each core is subjected to the same heat treatment as every one of its mates.

How Phosphorus Influences Graphite Formation in Iron Castings

CONCERNING the effect of phosphorus on the graphitization of cast iron there is expressed considerable difference of opinion by writers in the earlier literature. Generally it is supposed that phosphorus favors the precipitation of graphite. Observation of certain irons for thin-sectioned machine castings convinced von Keil and Mitsche that this was not the case and led them to attempt an explanation which would reconcile previous conflicting evidences. Their results are given in *Stahl und Eisen* for July 18, 1929. The explanation is based on the constitution diagram of the ternary system Fe-C-P, which is given herewith.



Constitution Diagram of the Iron-Carbon-Phosphorus System

It is known that, in the iron-carbon alloys, an increase in carbon above the eutectic composition is accompanied by a decrease in the tendency to form graphite. In the ternary system, it is evident that the iron-carbon eutectic, represented by CE becomes lower in carbon as the phosphorus content is raised. Hence a hypoeutectic iron may easily become hypereutectic when its content of phosphorus is sufficiently increased. This would presumably result in greater stability of the graphite, as is the case with pure hypereutectic iron-carbon alloys.

A series of melts made up with varying silicon contents and subjected to different rates of cooling indicates that the earlier observations attributed to phosphorus the ready separation of graphite which is really due to the presence of silicon and to a slow cooling.

Lacquered Pipe Proof Against Abrasion and Acids

Hammerproof and acidproof lacquer has been developed in Germany and applied to such products as steel pipe. Prof. W. Trinks, Carnegie Institute of Technology, Pittsburgh, told a sectional meeting of the American Society of Mechanical Engineers about it at Akron, Ohio, Oct. 23.

The lacquer, besides being virtually hammerproof, withstands, he says, even boiling hydrochloric acid. "The pipes to be coated are pickled, rinsed, dried and dipped in the lacquer, which is a phenol-formaldehyde condensation product; they are then baked and are ready for shipment. In places where pipes are cut, welded or threaded, lacquer is applied with a brush and baked with a blowtorch. There is only one thing wrong with this lacquer, namely, that the owners of the patent application ask for too much compensation for the rights in the United States.

"This lacquer is also being considered for structural material and promises to be a severe competitor to the new rustproof structural steels which contain copper and chromium. It is likewise a competitor to tin plate for cans, buckets, dishes, basins and so forth, and a competitor to zinc and lead not only for pipes but also for roofing sheets. Lacquered sheets can be doubled without cracking of the lacquer."

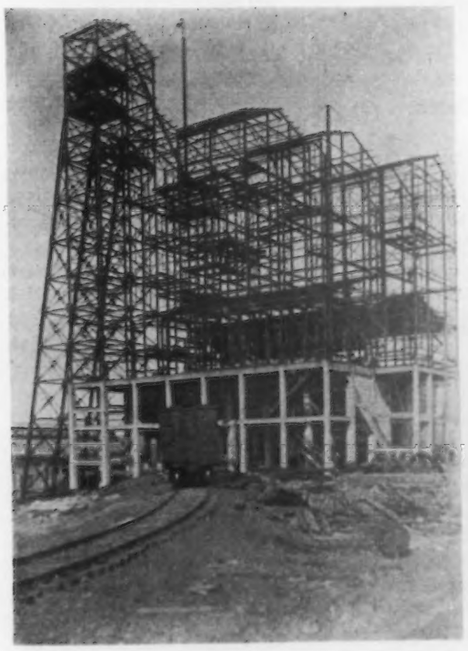
Steel Construction In Coal Mines

Rehabilitation of Locust Summit Breaker Emphasizes Progress Made in the Use of Steel in Pennsylvania Mines

BY FRANK W. JONES

PASSING of wood for important construction in and about the anthracite mines of Pennsylvania is emphasized by the large use of steel in the program of the Stone & Webster Engineering Corporation in its rehabilitation of the properties of the Philadelphia & Reading Coal & Iron Co.

About 25 years ago there were no steel coal breakers in the Pennsylvania coal region. Today, practically all new construction as well as important replacement and repairs are of steel. Illustrated are a typical wooden coal breaker of 25 years ago, compared with a steel coal breaker now in use, and the old method of heavy timbering



ABOVE, Modern Steel "Timbering" in a Coal Mine Contrasts Favorably with the Old Method of Heavy Wooden Timbering in Gangways. Below is the structural steel frame of a modern coal breaker compared with the Short Mountain breaker of 25 years ago, when wooden construction was general throughout the Pennsylvania coal region

of gangways compared with modern steel "timbering."

Impetus was given the use of steel when in 1912 the Mineral Spring breaker at Wilkes-Barre, operated by the Lehigh Valley Coal Co., was destroyed by fire and replaced by a steel structure. This construction was followed by other steel breakers, notably the Woodward, for the Delaware, Lackawanna & Western Coal Co. at Scranton, now the Glen Alden Coal Co., and the Nesquehoning breakers for the Lehigh Coal & Navigation Co., Lansford, Pa. The Woodward breaker required approximately 4500 tons of steel and the Lansford breaker about 8000 tons.

The initial unit of the Philadelphia & Reading Coal & Iron Co. at Locust Summit will require about 3000 tons of steel for the breaker, for the other buildings and for small bridges.

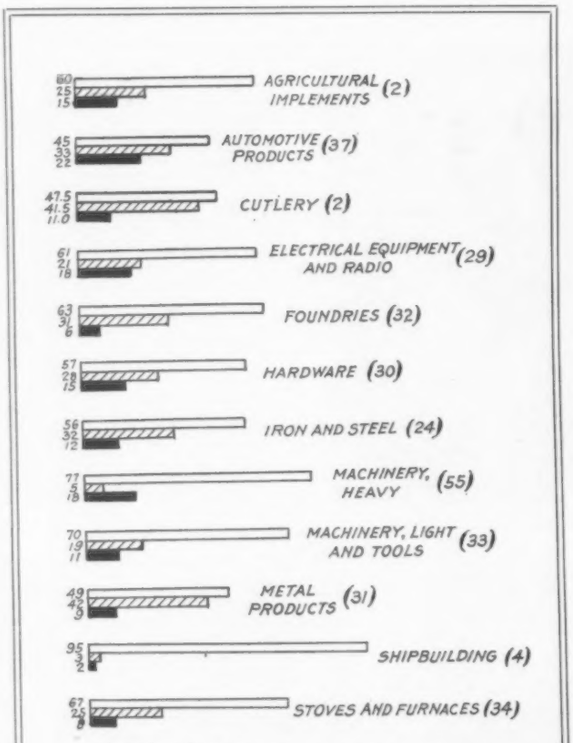
This provides for a structure with a capacity for the preparation of 12,000 tons of coal a day, which will supersede a number of smaller units now preparing from 1000 to 2000 tons of coal a day. The Chance flotation method of separating the slate from the coal will be used in this operation, so that hand slate picking will be entirely abandoned.

Varying Methods of Wage Payment

Two-thirds of Companies Use Straight Time; One-fourth, Piece Rate; Remainder, Bonus—Group Incentives in Metal Working

ANALYSIS of wage payment methods in 893 industrial companies having more than 500,000 employees shows that 66.4 per cent of the companies pay their men on a straight-time basis—either hourly, daily or weekly. These figures, compiled by the Sherman Corporation, Boston, show also that 24.1 per cent of the companies pay on a piece-rate basis, while the remaining 9.5 per cent pay on a premium or bonus basis. The latter are confined to those cases where definite standards are set and extra awards paid according to a planned schedule. No sporadic or opportunistic bonuses, vacations with pay, profit-sharing plans or life insurance are included.

Of all the companies reporting, 39 per cent had made changes in methods of paying wages during the past 20 years. These changes had been on a rapidly ascending scale, as 69.4 per cent of all had taken place between 1924 and 1929 and much smaller percentages in the three previous 5-year periods of the 20 years: 21.9 per cent in 1919-1924; 5.8 per cent in 1914-1919; 2.9 per cent in 1909-1914.



METHODS of Wage Payments Analyzed for 313 Companies in 12 Branches of Metal Working. Open bars represent straight time; hatched bars, piece rate; solid black, premium or bonus. Figures in front of bars give percentage distribution of employees as to wage plan; numbers of companies are in parentheses

Adoption of incentive plans had shown decreased manufacturing costs in 99.1 per cent of the cases. In the remaining 0.9 per cent of cases, manufacturing costs were increased. Similarly, employee earnings were increased in 99.7 per cent of the cases and decreased in only 0.3 per cent. As made, the analysis covered 43 different industries, with varying numbers of plants represented, from a minimum of two to a maximum of 74 in a single industry. The diagram herewith accounts for 12 of the industries lying within the specific field of metal-working.

The numbers in parenthesis after the name of the industry represent the number of concerns in the survey. The numbers standing in front of the several bars for each industry represent the percentage of employees being paid on the basis shown. The unshaded bar represents straight time; the cross-hatched bar, piece rate; and the solid bar a planned premium or bonus arrangement.

One of the outstanding developments in incentive method in paying wages during the past three years is said to have been the growing adoption of group methods rather than individual incentives. Group plans of one kind or another were found particularly noticeable in the automotive, heavy machinery and light machinery classifications.

W. Jett Lank, in his new book on "New Industrial Revolution and Wages," is inclined to the position that regardless of the method of payment, the total wages paid should be such as to insure a high rate of productive efficiency. Whereas much used to be heard of the "living wage" and the "cultural wage," he believes that industry has irrevocably committed itself in a practical and concrete way to the attitude and policy that wages may increase indefinitely so long as unit labor costs are not increased or profits reduced. For the immediate future, the pressing problem will undoubtedly be the working out of the proper share which the various occupational groups will receive in these enhanced wages.

Forge Shop for Aluminum Alloys

Furnaces, Hammers and Heat-Treating Equipment Installed for Daily Capacity of Ten Tons; Sizes Range from Tiny Parts to Airplane Propellers or Locomotive Side Rods

MANUFACTURE of aluminum forgings from strong alloys on a commercial basis was started about ten years ago by the Aluminum Co. of America at its Cleveland plant. Since then there has been important progress in the development of suitable alloy compositions to meet special requirements and perfection of heat treating processes, the application of which has resulted in improved physical properties of the metal. With the production of wrought alloys of greater tensile strength and increased hardness the field for forgings has been materially broadened, and this branch of the aluminum industry as well as the market for aluminum castings and rolled products has enjoyed a steady growth. The rapid advance of the aircraft industry, that demands engineering metal combining both strength and lightness, is probably responsible more than any other factor for the marked expansion of the market for aluminum forgings.

Hand in hand with the development of aluminum alloys, important improvements in dies and die making practice have occurred. The company's engineering and research departments have devoted much attention to designing parts to permit them to be made from forgings. Parts are now being forged of aluminum that it is claimed would not be attempted with steel.

Surface of Forging Billets Must Be Perfect

A NEW aluminum forge shop with a yearly capacity of 6,000,000 lb. (approximately 10 tons per day) of finished forgings is being built by the Aluminum Co. of America at its Cleveland works, and will soon be ready for operation. This company has pioneered in the production of aluminum forgings and the experiences it has had and the marked progress it has made in this field form a substantial basis for laying out and providing with mechanical equipment a plant arranged for the continuation of the methods and practices that it has successfully developed.

The secrets of the company's success in making aluminum forgings are mainly metallurgical. They include metallurgical control of the composition, proper forging temperature, close temperature control in heat treating and proper design of the forgings. Standard types of hammers such as are used in forging steel are employed. However, some of the operating methods differ from those followed in a steel forging shop; for example, highly polished dies are used and special methods of lubrication are required.

Production of aluminum forgings has presented two other major difficulties not encountered in the production of steel forgings.

At the beginning there was no stock available that was suitable for forgings. It was necessary, therefore, to develop methods and plant for making stock coincidently with the development of the forging business. This problem proved to be a very considerable one, with the result that up to date most of the stock used has been prepared in the forging department itself.

A good surface is more difficult to obtain on aluminum forgings than on steel. The scale which forms on the latter has been a blessing in disguise, for with its removal many skin-deep imperfections disappear. No such scale forms on aluminum forgings—hence, skin-deep imperfections must be avoided. In order to accomplish this result much greater care—with its incidental expense—is required in the preparation of the stock for forging.

Hammers Operated by 100-Lb. Air

AS the mechanical processes involved in forging aluminum do not differ materially from those for steel, the new aluminum forge shop is very similar in mechanical equipment and in general appearance to a well equipped forge shop. The buildings are arranged somewhat in the form of a U. The forge shop is 300 ft. long and 80 ft. wide. Parallel to it and separated by an open court 40 ft. wide is a building 50 x 240 ft. occupied by the die room and shipping department. At right angles to and connecting these two buildings at one end is the heat treating department, 60 x 170 ft. This arrangement permits convenient straight line routing of work through the forge shop, heat treating department, inspection department and finally to shipping room. The plant is designed so that extensions can be added to triple the present floor space.

Equipment includes two 18,000-lb. and one 14,000-lb. Erie drop hammers and also a 12,000-lb. Chambersburg hammer for forging large pieces such as aeroplane propellers and crank cases. An open frame 5000-lb. forging hammer will be used for making locomotive side and connecting rods, street car forgings and other large hand forgings. Eight smaller steam hammers and three board drop hammers ranging in capacity from 1000 to 3000 lb. will handle the smaller work.

All hammers will be air operated. In the existing forge shop it had been found that the use of air instead of steam for hammer operation is more economical, both in hammer upkeep and in power consumption. Advantages claimed for the air operated hammer are that the power can be shut off when the hammer is not being used (continued operation being necessary with steam hammers to keep the condensation low), there is no hot water running from the hammer as when steam is used, the pressure is always uniform and there is no danger of cracked cylinders from freezing during the winter.

Air will be supplied to the hammers at 100-lb. pressure by an 8000-cu. ft. Nordberg air compressor located in a separate 55 x 80-ft. building at the side of the forge shop. (This compressor has aluminum pistons, aluminum crossheads and forged aluminum connecting rods.) A receiver just outside the building delivers to a main supply line to which feeder lines connect each hammer. Three surge tanks will maintain a uniform air pressure when there is a heavy drain on the system. Intake and exhaust pipes are underground, the main exhaust line extending lengthwise under the center of the building.

Forge Shop of Glass and Steel

THE forge shop is 44 ft. high, providing sufficient room for handling all hammer parts with a crane except the sub-bases and anvil blocks. This arrangement

will be found particularly convenient in handling hammer rods. The shop is served by a 15-ton Cleveland traveling electric crane, with 5-ton auxiliary hoist.

The shop is of steel frame construction with glass sides with the exception of a band of corrugated iron at the crane rail and a section of the building just above the floor level in which are sliding 9 x 9-ft. wooden doors (the only wood in the building). It has a flat gypsum roof. Window sash are steel, with motor-operated ventilating sections.

Hammers are mounted on substantial concrete foundations, those for the larger units extending from 17 to 22 ft. below the floor level. Concrete runways are laid between the hammers. Most of the hammers will be served by two continuous electric heating furnaces, so that there will be no danger of the hammer-men getting cold metal. The speed of the furnace conveyors will be regulated to bring the material to the proper heat, as indicated by a thermocouple, of 750 deg. to 850 deg. Fahr.

Larger forgings will be hot-trimmed on presses adjoining the hammer and smaller work will be cold-trimmed and brought down to size on coining presses, for which Bliss and Consolidated equipment will be used.

Heat Treating Done in Pit Furnaces

FOUR pit-type electric furnaces are provided in the heat treating department. These are approximately 5 ft. diameter and 12 ft. deep, with tops about 2 ft. above the floor. This building has a basement to permit easy access to the furnaces for repair work, and to provide good ventilation.

Forgings on leaving the trimming presses will be placed in stainless steel baskets 55 in. diameter and 3 ft. deep and holding 2000 to 3000 lb. In these they will be handled in and out of the furnace by an overhead electric traveling crane. The forgings will remain in the furnaces from 6 to 18 hr., depending on the size of the section, but the practice will be to maintain a uniform heat treating temperature of 960 deg. Fahr., plus or minus 10 deg., on all classes of work. At this temperature the hardening constituents go into solution in the aluminum and are retained in a high degree of dispersion by the quenching operation.

After quenching, the tensile strength, yield point and hardness are further improved by aging either at ordinary temperatures (in the case of the alloy known as 17S), or at 310 deg. Fahr. in the case of alloys 25S and 51S. The artificial aging of the latter two will be done in the same furnaces as were used for heating, they being equipped with high and low temperature controls.

Furnaces are controlled by Wilson-Maeulen instruments; Tapalogs located in an instrument room record the temperature on charts. The switch panel, relay and instruments are suspended on springs to avoid the effects of vibration caused by the hammers.

Three alloys are used for forgings, these (after heat treating) being designated 17ST, 25ST and 51ST. Alloys 17ST and 25ST have a minimum tensile strength of 55,000 lb. per sq. in.; 51ST of 40,000 lb. per sq. in.; the yield point is 30,000 to 40,000 lb. per sq. in. for all three; elongation is 16 per cent for the former two and 12 per cent for the latter; Brinell hardness is 100 for all three alloys. These properties are obtained from standard size test specimens taken in the direction of maximum flow of the metal. Specific gravity ranges from 2.69 for 51ST to 2.79 for 25ST, or about one-third that of steel.

Rigorous Testing and Inspection

FOLLOWING the practice in the present forge shop, all forgings will be etched to provide a bright surface so that all defects in the forging, even minute line cracks, can be seen. The etching operation includes immersing the work in a caustic solution, washing it in warm water and then giving it an acid dip.

A testing laboratory is maintained for all forge shop products. Every heat is analyzed and the analysis of the bar stock accompanies the material from the rolling mills through the forging processes. Bars are tested for physical properties before they go to the hammers. Large pieces, such as airplane propellers and crankcases, carry a serial number and a test bar which accompanies them through the work until the forging and heat treating is completed, thus providing 100 per cent inspection of physical properties. The new forge shop will have a testing laboratory equipped with a set of indicating tensile testing machines supplied by Alfred J. Amsler & Co., as well as other testing equipment.

As a result of such care in the composition, forging, heat treating and inspection, it is stated that there have been no failures of forgings that could be attributed to the quality of the forgings. Forgings are now being made of a wide range in sizes and uses, extending from locomotive side rods weighing 700 lb. down to small parts for vacuum cleaners, typewriters and sewing machines. Among the more important forgings are airplane propellers and fittings, and various other forgings used both in aircraft and automobiles, including crankcases and connecting rods. Other common uses for aluminum forgings are for spray gun bodies, pneumatic tool parts, and connecting rods and other parts for outboard motors.

Plastic Seal for Stopping Gas Leaks from Furnace Settings

IN describing a large German open-hearth furnace some months ago a writer in *Stahl und Eisen* referred particularly to insulation on the four regenerator chambers. Steel plates were placed against the walls from the top to a depth of about 20 ft. The object was to prevent infiltration of air and at the same time gas leakage through the joints of the brickwork.

It is said, however, that this purpose is served only partly, as the gas presses through the joints and cracks in the walls, rises between the walls and the casings, and escapes where the plates terminate. This leakage is said to be especially noticeable when mixed gas is burned.

All attempts to stop this leakage by filling the cracks and holes with mortar have proved futile. Investigation with an experimental chamber at the Ruhrort-Meiderich Steel Works showed unexpectedly high figures for losses caused by air infiltration and gas leakage. In this chamber an effective seal was obtained by applying between the bricks a plastic sealing material which would permit the walls to expand and contract without breaking or cracking joints. This plastic mass, known as "Aerodensit," was applied also to the regenerator chambers.

It is said to be economical in application and low in cost. After the roofs had been sealed the success of the device was said to be evident, but figures for savings were not given. In building new furnaces it was planned to apply this material between the joints and over the brickwork and not to use steel sheets. Thus the exposed brickwork can be inspected whenever desired, which, of course, the steel casing does not permit.

Making Motor Integral with Machine

Builders, in a Revolutionary Economic Change, Are Coming to Merge the Power Units Into the General Composition of Industrial Machinery

BY WALTER STUART KELLEY

FUNDAMENTAL conditions that presaged a revolution in machine design were noted in a previous article. An epoch-making change was there forecast, by reason of freer use of electric means to impart motion (and power) directly at one or more points, rather than, as heretofore, to carry the initial motion throughout the machine.

The reason for redesigning machinery to make electric drive (or drives) an integral part of the machine is not merely to effect a theoretical gain, but to secure a very substantial improvement that will result. The warrant for such redesign is solely the resulting gain to the builder or to the user, or to both.

This new principle in machine design is already evidenced by various electrically-driven tools and appliances recently put on the market. It is to be noticed in certain instances of electric drive on a large scale in the steel mills. Practical application of the idea has enabled the writer to cut the floor space in one manufacturing process more than one-half.

Not every machine is adapted to such redesign. Many are, and in some cases there will result radical changes in organization and appearance.

WHAT he terms a new epoch in machinery construction is now under way, according to Mr. Kelley, who is a consulting engineer of Boston and owns to an experience in mechanical design dating from 1890 and in electrical design dating from 1906.

An introductory article by Mr. Kelley appeared on page 1229 of THE IRON AGE of Nov. 7. This pointed out how the new development, revolving about the application of power, means a breaking away from tradition in not trying merely to replace hand power; also in making the power centers internal rather than external parts of a machine and finally in considering the manufacture of the power units a function of the machinery builder himself.

Advantages of Integral Electric Drives

THE advantages to accrue are manifold. The most important are: less wear, less attention, less maintenance, less power, greater efficiency, less floor space, improved quantity and quality of product. The last will result chiefly through the elimination of variable speed caused by belt slippage. Few manufacturers realize to what extent production is lost and quality sacrificed through belt slippage. Graphs made by instruments that record instantaneous irregularities show amazing variations of speed in supposedly well equipped factories. It is not unusual with mechanical distribution of power to find five, six and occasionally eight belts between the prime mover and the driven machine. Each belt intervening is an element of variable slip, progressively because of gradual stretching, and from day to day because of changes in temperature or humidity. Momentary variation in speed may be 6 per cent above or below normal. In such a case, if the speed is made absolutely uniform, the running speed can be raised to the average maximum of the variations, with a gain of say 5 per cent in production.

The implications of the impending changes in machine design are many and varied. Broadly, of economic interest to the whole country, is the production of better goods at less cost, because of reduced floor space, greater efficiency and higher productive speed. This will be especially true of goods produced for the ultimate consumer. It is evident that when these results are realized, even with individual machines, the manufacturer must perforce scrap out-of-date equipment and install the new. He should sense this early enough to prepare for it through the depreciation account.

As a corollary to this situation it is evident that when manufacturers of machinery themselves build electric drive into their machines, there will be a materially lessened demand for standard type motors as now built by electrical manufacturers. This will be particularly true of the larger sized electric motors, with general acceptance of the individual-drive idea.

Power Application Viewed as External Thing

IN certain lines of production the essential features of the machinery used have not changed since power machines were first built. This is especially true with respect to machines originally designed and built for hand operation. With these and other early forms of machines, the first fifty years were required to eliminate the difficulties that developed because of the different conditions introduced by power drive. During the last fifty years crudities have been eliminated, refinements added and the use of the machines extended.

Textile machinery affords an excellent illustration of the developments following the application of power to hand machines. The hand mule—in use 60 years ago—was simply the hand spinning wheel with a hundred or more spindles instead of one. Power was used to turn the large number of spindles, hand operation was closely copied, even to the use of a gig wheel. With mule spinning today the same movements are automatically reproduced by power. The plain goods loom now used has the same parts as the old hand loom with some added refinements; it is a very interesting combination of reciprocating and rotary movements, both fast and slow. The original power card is essentially reproduced in the card now built. Textile machinery as a whole offers a very attractive field for redesign with built-in electric drive.

The greatest invention has been displayed in ma-

chinery originated more recently expressly for power operation, where there has been no incentive to copy former hand movements. In this class may be mentioned, by way of illustration, machine tools and shoe machinery, all of which has been designed expressly for power drive.

The fundamental idea of electrical power distribution is diametrically opposed to that of mechanical power distribution. That fact, plus force of habit, are the explanation why few men with strictly mechanical training are qualified to lay out properly and efficiently an electric drive, much less undertake electrical design. It accounts, too, for the rather slow application of the individual drive idea.

Mechanical distribution of power by shafts, pulleys and belts—practically the only method in use fifty years ago—drives each machine through these mechanical agencies from a single prime mover; whereas, with complete electrical distribution, belts and shafting are dispensed with and what is essentially a prime mover, applied directly to each machine, or, better still, incorporated in its construction. The comparison is between distribution and concentration.

Now it is obvious that with electrical concentration of power in each machine, the manufacturers of shafting, large belts, pulleys, bearings, etc., will face a gradually diminishing market for such products; likewise the builders of engines of all sorts not adapted for driving electric generators. Engine builders face the elimination of small prime movers, except where electrical transmission is not available, as with boats. More and more as time passes will electricity prevail in power applications; electricity furnished by large power stations, parts of an extensive super-power network. The so-called isolated, or local, power plant is doomed; those who manufacture apparatus for such plants must look elsewhere for their business.

Machinery Builder Will Make Electrical Parts

THE one most directly and intimately affected by these epoch-making changes in business alinement is the machinery builder. He must accept the situation and prepare for it, or change his line, or curtail. Assuming the machinery builder affected elects to swim with the tide and redesign his line, will he build the electrical parts for his machines? He cannot well do otherwise. The relation of parts is too intimate and specialized to have them made in different shops. This does not oblige him to face the exploration of an electrical or technical labyrinth. The obstacles are largely mental.

Alternating current will be used for most electric drives; the motors are mostly machine work with simple and easily made electrical features. The stationary electrical member, the stator, will have lateral slots into which formed coils of insulated wire are fitted. Making and fitting these coils is the only essentially electrical feature of the machine except in special cases where speed control is required. Electrical design is practically an open book today. There are no basic patents to make trouble. The first concern in the field, however, in the design of any particular line of machinery will be able to protect its own designs by construction patents that will trade-mark its output.

One Experience in Combining Motor with Machine

IN working out a particular case where the driving motor was incorporated as an integral part of the machine, the simplicity of the motor construction was surprising. The only parts added for the motor were two laminated rings of metal, one attached to the revolving part of the machine and the other to the end frame. There were neither casing, bedplate, shaft nor bearings, corresponding to such parts of a standard motor. What represented them were essential parts of the machine. The motor drive reduced floor space and added nothing to the machine that required attention. The only additional machinery needed for making the motor parts was a press to punch out the laminations for the rotor and stator rings. Given the data for the motor design, the only new help needed was for making the coils for the stator section. The cost will be less than for a standard type motor; the power used will be less too.

Such machinery is all to the good for the factory using it. When it is available in quantity none other will be used where electricity is available. The only adverse factor is that the builder will have to make and stock a different line of parts for each machine built. This is a matter deserving consideration, for it may mean a change in the line of machines that a manufacturer builds. The difficulty seems serious, but it is nine-tenths mental.

Suppose a shop is building, say, 20 different machines, used successively in producing one line of goods. By tradition and habit—mental habit—the management thinks it must continue to produce the entire line of machines. But there would be at least one electric motor drive for each machine, and for some machines perhaps two or three, say altogether thirty motor parts to be made and stocked. This would be too many to produce at low cost for the number marketed unless manufacturing was on an extensive scale.

The manufacturer is therefore confronted with the necessity of making, what is to him a momentous decision—of breaking with tradition. Will he continue to build the full line of 20 machines, with active competition on each one, or will he narrow his production to one-fourth as many (or even less), and produce in quantity the ones he continues to build? Good judgment dictates the latter course, for besides wisely meeting his particular case, it is in line with the twentieth century principle of economics—lower cost through mass production.

Deoxidized Copper for Welding

SINCE the small amount of oxygen purposely remaining in pure copper slabs, bars, plates and sheets makes it impossible to weld this material satisfactorily, copper and brass mills have placed on the market a deoxidized copper, according to W. R. Hibbard, technical department, American Brass Co., Waterbury, Conn., speaking before the recent meeting of International Acetylene Association. This is made by adding sufficient deoxidizer to the molten copper to remove all oxygen; usually a slight excess is added, as it is hard to know exactly how much oxygen is present in the metal.

Common deoxidizers for this purpose are phosphorus, silicon, manganese, zinc, cadmium and calcium boride. With the exception of the last one, the slight excess of deoxidizer remains in the copper; the boride takes up oxygen and floats off with the slag. From 0.03 to 0.15 per cent of the others may be residual (except cadmium, which is liable to run from 0.10 to 0.50 per cent).

A weld made with deoxidized copper will process easier and have nearly twice the strength of one made with electrolytic copper. There is one disadvantage to deoxidized copper and this is where high electrical conductivity is required. Very slight percentages of some deoxidizers decrease the electrical conductivity, in the case of phosphorus cutting it to one-fifth its normal value.

Corrosion by Superheated Steam

Investigation of Large Operating Boilers and High Pressure Experimental Boilers Indicates That Steel Is Corroded at Negligible Rate

BY J. K. RUMMEL*

WITHIN the last few years in central stations, steam pressures have been increased from 250 lb. to 1400 lb. per sq. in. and steam temperatures have increased from 600 deg. Fahr. to 750 deg. Fahr. at the superheater outlet. Even higher steam pressures and temperatures are being considered. Abroad, slightly higher steam temperatures have been in use on smaller installations at lower capacities than are common in America.

This trend toward increased temperatures and pressures, together with certain operating experiences, made it desirable to study the probable extent of the reaction beween iron and steam at the elevated temperatures existing in steam superheaters. This reaction, which proceeds at a low rate at temperatures around 900 deg. Fahr., and probably approaches maximum velocity at approximately 1470 deg. Fahr., may be expressed

$$\underset{\text{Iron}}{3\,Fe} + \underset{\text{Steam}}{4\,H_2O} = \underset{\substack{\text{Magnetic}\\ \text{iron oxide}}}{Fe_3O_4} + \underset{\text{Hydrogen}}{4\,H_2}$$

Since the early part of 1926, the service department of Babcock & Wilcox Co. has investigated five boiler units which represent a considerable range in operating conditions. These installations, designated as *A*, *B*, *C*, *D*, and *E*, are described in Table 1. Briefly the conditions were as follows:

A. Radiant heat superheater, 3-pass. Last pass equipped with Enduro KA2 tubes. Pressure: 200 lb. gage. 100 per cent makeup water treated, in the boiler, with soda ash, sodium phosphate and quebracho.

B. Stirling type boiler with convection single pass superheater. Pressure: 400 lb. gage. Feed water: all condensate with low oxygen content.

C. Babcock & Wilcox boiler with interdeck 3-pass superheater. Pressure: 600 lb. gage. Feed water: condensate from condensers using zeolite and acid treated makeup water. Practically no oxygen in the feed water.

D. Similar to C, except that the makeup water was distilled; the water to the evaporators being pre-treated in a lime and soda ash treating system. Practically no oxygen in the feed water.

E. Experimental boiler. Pressure 1500 lb. to 3200 lb. Feed water: condensate with sodium phosphate addition but with poor control of oxygen content.

The method used for measuring the rate of corrosion is based on the evolution of hydrogen by the reaction quoted above and the measurement and analysis of the gas in different parts of the system. Methods of sampling, gas separation and analysis were developed.

A selection of the results are reported in Table II for these five installations, representing operating pressures from 200 to 3200 lb. per sq. in. and final steam temperatures ranging from 600 to 790 deg. Fahr.

Method of Sampling and Gas Analysis

With minor modifications at different stations, the method of separating the gas from steam or water, at the desired sample points, is as illustrated on page 1527.

The sample, entering at the point marked "steam in-

*Chemical engineer, service department, Babcock & Wilcox Co.

Table I—Operating and Engineering Data

	Station A	Station B	Station C	Station D	Station E
Type of economizer	None	B. & W. Steel	B. & W. Steel	B. & W. Steel	
Type of boiler	B. & W.	Stirling	B. & W.	B. & W.	
Type of superheater	3 pass radiant —Enduro KA2 3rd pass	Convection— 1 pass. Steel	Interdeck— 3 pass. Steel	Interdeck— 3 pass. Steel	B. & W. Steel Experimental
Temperatures deg. Fahr.					
Leaving economizer	.....	.....	385	310	375 to 450
Leaving boiler	395	450	480	480	700 to 728
Leaving superheater	730 to 790	700 to 725	720 to 750	710	712 to 778
Leaving superheater (2nd pass)	590 to 636	.....	.....	.....	.....
Superheater tubes, maximum	943 to 1200	900	900	900	.....
Furnace (flame)	2350	.....	.....	.....	2600
Boiler Data					
Boiler pressure — lb. per sq. in. approx.	200	400	600	600	1500 to 3200
Rate of evaporation—1000 lb. per hr.	17 to 19	150 to 350	125 to 170	115 to 135	1.6 to 3.4
Time of steam in superheater	0.216 sec.	1.4 sec	1.0 sec.	.....	5.6 sec.
Internal area of superheater tubes	251.5 sq. ft.	4,785 sq. ft.	3,280 sq. ft.	2,068 sq. ft.	24.58 sq. ft.
Water conditions					
Make up—per cent	100	2	2	1.5	2
Treatment of make up water	Soda ash and quebracho	Distilled	Zeolite and acid	Distilled	Distilled
Internal boiler feed water treatment	Sodium phosphate	None	None	None	Sodium phosphate
Method of deaerating feed water	None	Vacuum condensers	Vacuum condensers	Vacuum condensers and deaerators	Partial vacuum condensers
Oxygen in feed water—cc. per liter	3 to 6	0.08 to 0.18	0	0.025	0.16 to 1.8
Boiler water analyses, parts per million					
Sodium alkalinity as Na_2CO_3 equivalent	450	0.00	400	50	32 to 736
Sodium phosphate as Na_2HPO_4	50	.....	.....	.....	0 to 700
Total solids	1700	260	2,400	140	50 to 800

NOTE: The above figures are approximate values and do not cover all operating conditions.

let," first passes through a condenser where the steam is condensed and cooled to approximately room temperature. As shown by arrows, this condensate passes in turn through a gas separator, water tank and waste line. The rate of flow through the apparatus is estimated at intervals by directing the condensate into the measuring cylinder. When the water tank has been washed free of deaerated water with which it was previously filled, the gas collector at the outlet is filled with fresh condensate; the gas in the gas separator is transferred to a gas receiving bottle (marked "gas holder") and the sampling operation is stopped. The water in the tank is now boiled until free from dissolved gases, (by means of the steam coil therein), and the flow of steam and liberated gas from the top of the tank is passed into the gas collector. Steam condenses in the collector, while the gas rises to the top and is withdrawn into a separate gas receiving bottle. (The first gas separator is used to collect any free gas in the condensate, while the tank and second gas collector make it possible to recover the gas which remains dissolved in the condensate.)

The two gas samples, representing free gas from the gas separator and the dissolved gas from the tank, are then analyzed and measured in a Burrell (Bureau of Mines) Orsat apparatus; determining carbon dioxide, oxygen, hydrogen and carbon monoxide. Nitrogen is

Table II—Summary—Gas In Steam—Average Results

Station	Sample Point	Boiler Pressure, Lb. per Sq. In.	Steam Temp., Deg. Fahr.	Evaporation, Lb. per Hr.	Cc. of Gas per Liter Condensate	Pounds of Each Gas per Million Pounds Steam: CO_2	O_2	H_2	CO	N_2	Totals	Boiler Water Analysis Parts per Million: Na_2CO_3 Equiv.	Na_2HPO_4	Remarks
A	Superheater, inlet.	222	395	19,182	30.694	11.6221	8.1009	0.0196	0.0213	20.7456	40.5095	365	284	
	Superheater, 2nd pass outlet.....	...	590	....	32.145	12.4241	7.8173	0.0149	0.0000	22.2502	42.5065	...	...	Radiant superheater, 3rd pass Enduro KA2.
	Superheater, 3rd pass outlet.....	...	730	....	32.057	12.7005	7.7747	0.0288	0.0148	21.8039	42.3227	...	...	
A	Superheater, inlet.	224	396	17,513	30.987	11.1894	8.0555	0.0105	0.0931	21.4522	40.8007	...	...	Conditions same for all tests except rate of evaporation and final temperature.
	Superheater, 2nd pass outlet.....	...	640	....	29.391	10.8387	7.0854	0.0151	0.0442	20.6633	38.6467	...	...	The large amount of gas at this station has diluted the hydrogen gas to a very small part of the whole.
	Superheater, 3rd pass outlet.....	...	790	....	32.663	14.7850	7.2141	0.0290	0.0982	21.5893	43.7156	...	...	
B	Boiler outlet.....	400	444	151,000	0.9098	0.0000	0.0108	0.0117	....	0.8821	0.9046	No sodium Alkalinity	None	All conditions the same for these tests except rate of evaporation and corresponding temperatures and pressures. In later tests when the feed water was aerated the hydrogen increase through the superheater was about 0.005 lb./1,000,000 lb. A maximum of 0.016 lb. H_2/1,000,000 lb. was obtained at the superheater outlet.
	Superheater outlet.	...	710	....	1.0796	0.0009	0.0022	0.0129	....	0.9142	0.9302			
B	Boiler outlet.....	415	448	342,700	1.0052	0.0075	0.0898	0.0055	....	1.0064	1.1092	"	"	
	Superheater outlet.	...	750	....	1.0248	0.0056	0.0559	0.0061	....	1.0499	1.1175			
C	Boiler outlet.....	600	480	125,000	1.4134	0.9667	0.0042	0.0256	0.0206	0.5798	1.5969	380-480	None	
	Superheater outlet.	...	720	....	1.3870	0.9639	0.0039	0.0275	0.0196	0.5877	1.6026			
C	Boiler outlet.....	600	480	170,000	1.0902	0.6358	0.0056	0.0333	0.0375	0.3491	1.0613	380-480	"	
	Superheater outlet.	...	746	....	1.1155	0.6279	0.0066	0.0370	0.0380	0.3317	1.0412			
C	Economizer outlet.	600	380	125,000 to 170,000	1.2570	0.5229	0.0064	0.0187	0.0000	0.8533	1.4013	380-480	"	Steam flow and gas evolution somewhat erratic for this station.
	Boiler outlet.....	...	480	....	1.5042	1.0767	0.0047	0.0228	0.0204	0.7121	1.8367			
C	Economizer inlet..	600	...	125,000 to 155,000	0.3421	0.0136	0.0358	0.0004	0.0000	0.3491	0.3989	380-480	"	
	Boiler outlet.....	...	480	....	0.7878	0.4477	0.0025	0.0199	0.0312	0.3155	0.8168			
D	Boiler outlet.....	600	480	125,000	0.157	0.0100	0.0025	0.0106	....	0.0238	0.0469	...	None	
	Superheater outlet.	...	710	....	0.184	0.0117	0.0029	0.0126	....	0.0274	0.0546			
D	Boiler outlet.....	600	480	130,000	0.120	0.0059	0.0012	0.0072	....	0.0339	0.0482	3	"	Small quantities of gas at this station made analysis difficult.
	Superheater outlet.	...	...	....	0.132	0.0071	0.0008	0.0079	....	0.0366	0.0524			
D	Economizer inlet..	600	200	125,000	0.126	0.0081	0.0269	0.0004	....	0.1116	0.1470	60	"	
	Economizer outlet.	...	310	128,500	0.144	0.0047	0.0138	0.0063	....	0.0632	0.0880			
E	Economizer inlet..	1552	273	3,201	8.4290	0.1278	2.4161	0.0037	0.4580	7.4507	10.4563	54	157	This group of samples taken at different times. Poor deaeration of feed water.
	Boiler outlet.....	1553	658	3,387	4.1699	0.1063	0.4152	0.0085	0.2274	3.6916	4.4490	170	284	
	Superheater outlet.	1551	609	3,385	5.3851	0.0429	0.8927	0.0125	0.2301	4.7010	5.8792	265	431	
E	Economizer inlet..	2445	323	3,038	7.9244	0.0182	1.8948	0.0062	0.0522	7.2489	9.2203	65	143	This group of samples taken at different times. Poor deaeration of feed water.
	Boiler outlet.....	2494	689	3,321	2.9006	0.0917	0.4083	0.0059	0.1693	2.6737	3.3489	208	96	
	Superheater outlet.	2519	684	3,362	7.0969	0.8092	0.7966	0.0228	0.2814	6.4341	8.3441	194	115	
E	Economizer inlet..	3430	196	1,682	1.753	0.0077	0.2351	0.0016	0.0234	1.7698	2.0376	32	18.7	Samples taken simultaneously in following tests. Deaeration of feed water improved.
	Boiler outlet.....	3354	714	....	1.869	0.0188	0.0449	0.0054	0.1263	1.9075	2.1029			
	Superheater outlet.	3233	746	....	2.489	0.0115	0.1160	0.0153	0.1989	2.3563	2.6980			
E	Economizer inlet..	3452	196	1,936	4.259	0.0317	0.4590	0.0040	0.0384	4.3839	4.9170	114.9	34	
	Boiler outlet.....	3335	716	....	4.591	0.0638	0.0635	0.0291	0.1681	4.6645	4.9890			
	Superheater outlet.	3227	740	....	4.808	0.0500	0.0632	0.0459	0.2867	4.5451	4.9909			
E	Economizer inlet..	3385	190	1,987	4.687	0.0622	0.6194	0.0033	0.0281	4.7626	5.4756	736.4	74.1	
	Boiler outlet.....	3385	718	....	5.164	0.0438	0.0443	0.0408	0.1184	5.2148	5.4621			
	Superheater outlet.	3221	758	....	6.195	0.0478	0.0963	0.0890	0.2346	5.5723	6.0400			

found by difference. Tests for hydrocarbons gave no more than traces.

From the data obtained, is calculated the volume of total gas per thousand pounds of condensate as sampled, and from this and the calculated average analysis of the gas in the sample, is found the pounds of each gas per million pounds of steam generated. The average analysis of the gas is calculated from the ratio of the water passed through the separator to the capacity of the tank and the volumes and analyses of the gas from the two sources.

Discussion of Data

The items of particular interest are the amounts of hydrogen made and the amounts of oxygen consumed under different operating conditions. From these may be inferred the amount of corrosion, by assuming that all of the hydrogen formed is the result of the reaction between iron and steam and all the oxygen consumed in the system is the result of its combining with hydrogen to form water. Under these conditions the formation of one pound of hydrogen would be equivalent to 20.744 lb. of iron and the consumption of one pound of oxygen would be equivalent to 2.617 lb. of iron. Thus, if a system generated 0.02 lb. of hydrogen and consumed 0.1 lb. of oxygen per million pounds of steam, the loss of iron in the system would be 0.677 lb. of iron. While this figure is considerably higher than found in any of the large boiler installations examined, (installations *B*, *C* or *D*), it is estimated that if this loss were distributed evenly over their entire surface, the tubes therein will give a satisfactory length of service before failures are likely to occur.

It is well known that hydrogen may be produced in the boiler system by reactions other than the one outlined above, and oxygen may be consumed in other ways than by combining with hydrogen gas. For example, the iron may corrode by combining with water to form ferrous hydrate and hydrogen gas, and the oxygen present then promote the oxidation of ferrous hydrate to ferric hydrate and iron oxides. It is therefore apparent that the iron equivalents for hydrogen and oxygen as given, are subject to interpretation depending on the existing conditions at the time the gas samples are taken. The probability that several simultaneous reactions take place in the system, makes it difficult to reduce pounds of gas to pounds of iron in the data presented.

Experience has fully justified the recommendation that oxygen in the feed water should be reduced to as near zero as is practically possible, in order to protect the surfaces in contact with both water and steam. This recommendation applies to the protection of superheaters as well, since there is ample evidence that superheater tube failures by corrosion have been greatly accelerated by the presence of oxygen in the steam.

Small scale experiments by C. H. Fellows (a) and J. Porter (b) have demonstrated that the reaction between iron and steam does not reach serious proportions in steel superheaters until the metal reaches or exceeds 950 deg. Fahr. Below 1000 deg. Fahr. the formation of hydrogen and iron oxide is found to increase slowly as the temperature increases. Above 1000 deg. Fahr. the formation of hydrogen and the corrosion of the metallic surface is considerably more rapid per unit increase in temperature. With tubes made of the alloy known as Enduro KA2 the rate of corrosion is considerably less and higher temperatures are permissible.

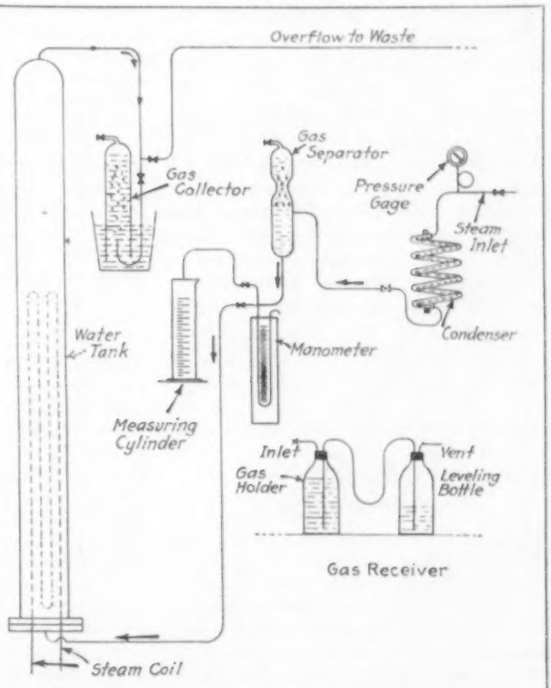
The general conclusions which may be drawn from the information available to date, are:

1. With oxygen-free steam, corrosion, due to the rate of reaction between steam and superheaters made with steel tubes, is negligible for steam temperatures up to 800 deg. Fahr. and tube temperatures up to 950 deg. Fahr.

2. The use of superheaters made with Enduro KA2 tubes with temperatures on the fire side up to 1200 deg. Fahr., is not limited by the reaction between iron and steam.

3. Hydrogen gas evolution (and corrosion in general) is accelerated by oxygen entering the system with the feed water, and the oxygen content of this water should be reduced to the lowest practical amount.

4. Within limits, the alkalinity of the boiler water will have no noticeable effect on the rate of reaction between iron and steam. A definitely alkaline boiler water and boiler feed water is preferred to prevent acid corrosion and limit corrosion due to other conditions. However, alkaline water does not stop corrosion due to oxygen.



Analytical Equipment for Measuring Gases in Steam Withdrawn from High-Temperature Superheaters

(a) Paper by C. H. Fellows of the Detroit Edison Co., before the American Water Works Association, at Toronto, 1929.

(b) Article by J. Porter, abstracted by S. T. Powell in his book, "Boiler Feed Water Purification," page 255.

Study Liquid Shrinkage of Metals

Progress in the investigation of the problem of liquid shrinkage, being carried on through the cooperation of the American Foundrymen's Association and the Bureau of Standards, is indicated in a report submitted by E. J. Ash, research associate for both organizations, to the committee on cast iron of the A. F. A.

A new procedure has been developed which is termed the crucible immersion method. This consists in immersing a crucible of known volume into a ladle of molten metal and filling the cavity of the crucible, allowing sufficient time for the crucible and the metal to reach a temperature equilibrium. When this state is attained a lid is pressed down firmly on the crucible and the whole removed from the melt. After cooling, the resultant ingot is weighed, and through the known volume of the crucible the specific volume value of the metal at the temperature of sampling may be determined.

Furnace Construction; Operation

Open-Hearth Men Consider Design of Furnace, Use of Auxiliary Equipment, Insulation, Character of Ports and Checker Brick

FUNDAMENTAL matters connected with the design of open-hearth furnaces were taken up, along with questions of quality control for steel and many other matters, at the autumn meeting in Chicago of the open-hearth committee of the American Institute of Mining and Metallurgical Engineers. The rapid-fire discussion of all these topics, participated in by operating men from many different steel plants, with no set papers and nothing printed, made this meeting one of unusual interest. The following pages conclude the story. The first section was on pages 1307 to 1310 of our issue of Nov. 14; the second, pages 1382 to 1384 of our issue of Nov. 21.

Auxiliary Equipment of an Open-Hearth Plant

BRIEF description was given by F. B. McKune, Steel Co. of Canada, Hamilton, Ont., of two new furnaces which he has installed within the past year The bath measures 15 ft. 6 in. x 42 ft. in surface area and has a depth of 3 ft. net. The foreplate is 4 ft. above the brick bottom of the furnace. This furnace over all is 77 ft. 6 in. long and the heat is 135 gross tons.

Regenerators are 23 ft. long and measure 20 ft. 6 in. high to the spring of the arch, the latter being 2 ft. 10 in. high. The brick checkers are 13 ft. 6 in. high. Air chambers at each end are 16 ft. 1 in. wide, while the gas chambers are 11 ft. 6 in. wide.

These furnaces are fitted to burn a combination of blast furnace and coke oven gas varying in proportion from 5 to 1 to about 2.3 to 1. The average fuel used in this mixture has a heat value of about 240 B.t.u. to the pound. One of the furnaces is fitted with control regulators.

During August, September and October more than 180 heats were taken out of the furnace with controls, with the following results:

	Heats	Tons of Ingots	B.t.u. per Ton
August	61	8,147	4,250,000
September ..	58	7,839	4,300,000
October	67	9,028	4,300,000
Total	186	25,014	

Average charges in October amounted to 143.6 tons, with heats averaging 134.8 tons. For the month, heats were made at the average rate of 12.1 gross tons an hour. These proceed at a very uniform rate, as many successive heats have been made with differences of not more than 10 min. between them.

It is the hope that tar may be burned in combination with blast furnace gas in these furnaces, using 16 or 17 gal. of tar to the ton of ingots and getting the remainder of the heat from blast furnace gas. The present stack temperature of about 1000 deg. Fahr. should be reduced to 800 deg., with proper control.

About 130,000 checker brick are used, measuring 4½ by 9 in. and with 54 sq. in. openings. The gas is not regenerated. Comparing the two furnaces, the automatic control arrangements drop the checker temperature about 200 deg. The two chambers, side by side, are running at about 2200 deg. for gas and 2100 deg. for air.

Blast furnace gas is heavy enough so that it lies close to the bath while burning. The port roofs are insulated and this is to be extended from each end of the main roof through about one-quarter the length of the roof. Thus, some 70 per cent of the total roof of the furnace will be insulated. The gas checker chamber is insulated, but the air is not. There is a brick stack 8 ft. in inside diameter and 225 ft. high.

Reversals are on a 20-min. schedule. This is found to accompany a drop of 110 deg., approximately, in regenerator temperatures. Complete combustion is obtained at about the center of the furnace. Some 260 B.t.u. for fuel is used for melting and then gradually the mixture is cut down until it reaches about 180 B.t.u., representing about six parts of blast furnace gas to one of coke oven gas. The port through which the gas comes is 9 ft. long, with a slope of 3 in. to the foot and sectional area of 1700 sq. in.

Thermal Units Consumed

Discussing heat economy in furnaces, one producer gas plant making steel castings reported about 4,500,000 B.t.u. consumed for each ton of metal charged. The producer is burning 550 lb. of coal at about 85 per cent efficiency. A natural gas furnace burning 5500 cu. ft. to the ton accounted for about 5,500,000 B.t.u. An oil furnace using 30 gal. to the ton, at 155,000 B.t.u., reported 4,655,000 B.t.u.

Other scattering reports showed 4,370,000 to 6,250,000 B.t.u. on producer gas, 6,700,000 B.t.u. on pulverized coal, 4,750,000 B.t.u. on natural gas, 5,000,000 to 5,900,000 B.t.u. on oil, 5,500,000 to 6,500,000 B.t.u. on tar and 4,300,000 B.t.u. on a mixture of blast furnace and coke oven gas.

A fuel engineer observed that it is possible to attain practically the same furnace efficiency, regardless of fuel, if the furnaces are designed properly for the fuel which is to be used.

Changing Producer Furnace to Natural Gas

IN making a change whereby a furnace built to burn producer gas is fired with natural gas, the opinion was expressed that the natural gas flame must be given a positive direction or it is likely to burn out the roof. There should be a pre-mixing burner. There will be little or no change needed in the uptakes. If a furnace is built with a single uptake, the initial cost is less than when three are fitted. Renewals, however, are more costly and the furnace may burn out the supporting wall.

Problems in Furnace Insulation

ONE plant has put Sil-o-Cel C-3 in the pan bottom of a furnace and has used less brick under the burned-in bottom surface. This furnace has made more than 700 heats; it is reported to be much cooler beneath this furnace than with the ordinary type and the bottom is holding up well.

In another plant a new 100-ton furnace, not yet in operation, has been insulated with 3 in. of C-3 cement, covering the rivet heads, and one course of C-22 Sil-o-Cel brick. Then there are four courses of fire-brick, 3½ in. of magnesite cement and then 17 in. of fused magnesite to make the bottom. The side walls have eight courses of C-22, making about 18 in.

Insulating checker chambers without changing the old walls was regarded as something of a makeshift. In one plant 1½ in. of Webber composition was daubed on, but it is now peeling off a bit. In another case, wire mesh has been fastened on the wall, and insulating cement thrown at it with a gun, by the Johns-Manville method. Still another plant has put 2½ in. of Sil-o-Cel on the roofs and covered them with Silcote. This has cracked open and the roof shows red hot through the cracks. This brings up the question of the structural steel

in there, which is not designed to stand a red heat.

One plant has used magnesia block over the regenerator chambers, covered with a steel mesh and Sil-o-Cel cement, and the whole thing inclosed in steel plates. Another man reported, however, that insulating engineers no longer advocate the use of steel plate. When holes form in the brickwork back of the plate they cannot be got at for patching. It was suggested that the plate might be put on in panels, easily removable, so that patches could be made.

Less Firebrick with Insulation

Another operator found it necessary to take down the side walls to put on insulation. Because of his clearances he took away enough of the fire-brick lining to make room for the Sil-o-Cel. Another man reported a furnace insulated and plated in, but stated that the insulation does not keep the heat in sufficiently well and the plate gets too hot. The opinion was expressed that cold air infiltration, however detrimental it may be to furnace balance, keeps the walls cooler than does the insulating material. Consequently, what is done by the methods in vogue consists more in air-proofing than in insulation.

One man, who has had all of his furnaces insulated, reported a producer gas consumption equivalent to 520 lb. of coal to the ton of ingots, everything included. He stated that this is a bit below the previous consumption, before the furnaces were insulated.

Purpose of a Venturi Port

ONE operating man reported great satisfaction from the use of a Venturi port on a producer-gas furnace. He stated that one such furnace which he had seen, and in which the regenerators were insulated and plated in, had its checkers so hot that they appeared around 2600 deg. Fahr. This led to the query from another man as to what refractories would stand that temperature.

A Canadian plant reported having to rebuild a flat roof over the gas port after 230 heats, out of 375 heats made in the entire run, with a Venturi port. The cross-sectional area at the knuckle was said to be 22 sq. ft. in a furnace having 40 sq. ft. for the air uptake and 5 sq. ft. for the gas.

William D. Pugh of the research department, English Steel Corporation, Sheffield, England, reported that the first Venturi port ever installed in an English furnace is now being put in.

One operating man described the Venturi port principle as an effort to approach the aspirating principle on the ingoing end and obtain a pre-mix of air and gas and, at the same time, on the outgoing end, not to oppose much resistance to the exit of the gases. High-velocity gas draws in air in the stream of gas and thus produces a good mix. With poor combustion, however, this flame would be likely to burn out the port at the outgoing end.

One Damper, or Several?

GOOD regulation is reported for furnaces which have separate dampers for each checker chamber and no main stock damper whatever. These furnaces, with their four dampers, appeared to give better regulation than obtained by the use of a stack damper; they have larger regenerators than in the latter case. In another plant where each chamber has its own damper there is also a main damper. Each chamber is regulated separately, resulting in keeping a more uniform temperature in the regenerators. Unless this is done the gas chambers get hotter than on the air side.

Blaw-Knox valves are used in another plant, giving different openings for the gas and the air; this is found to be very beneficial. The valves are governed through the use of recording pyrometers. There is a stack damper which is lowered in making bottom with the dolomite machine. Consequently little heat is lost through the regenerators at this time.

Flames Sweeping Wall or Roof

WHAT causes a flame to sweep along the back wall or to hang to the roof is a question which was discussed by several speakers. One man reported that, with a sloping back wall, the first part of the furnace to fail is along the skewback. It was found necessary, after about 125 heats, to put in a patch measuring about 3 x 8 ft.

This experience was verified by another man who stated that, particularly in the early part of the heat, that part is the hottest portion of the furnace. With light scrap piled up, the gases have to find their way to the outgoing port and take the line of least resistance. It was stated that we might increase the velocity of the gases and decrease the draft by reducing the amount of air which comes in through the front of the furnace and pushes the flame toward the back.

The opinion was expressed that reflection from the sloping backwall to the roof was responsible in part for the fact that it is necessary to put on a patch earlier with the sloping backwall than with the straight wall. Several speakers concurred in this view. In one case the rear skewback was raised and considerably more life was obtained from the backwall.

To obviate this trouble, particularly in furnaces which are filled up full with light scrap, one operator had the ports brought nearer the front of the furnace than their usual center-line position. This did not help; he then raised the skewback at the rear and obtained some benefit. One man reported, however, that he does not believe the trouble can be entirely obviated. A partial remedy was suggested, consisting in keeping the bridge wall low and consequently keeping the flame down nearer the bath.

Sloping or Inclined Port Roofs

WHY American furnaces must have sloping or inclined port roofs for directing the flame, whereas several efficient European furnaces have practically a straight roof, with only the gas roof pointing toward the bath, was a question which came up for extended discussion. One operator expressed the view that the roof has little or nothing to do with controlling the direction of the gas. He uses very little slope to his roofs. He stated, however, that the pitch of the port floor is the real answer, short ports needing a sharper pitch than long ones. With a Venturi port the pitch is only ¾ in. to the foot.

Producer gas furnace life was stated by this speaker to be measured by the life of the air chamber, which, in his practice, runs from 200 to 275 heats. The opening is 54 sq. in. and the checkers get very dirty. Using tar as fuel in the same furnace increases the life by about 75 heats.

One plant, using roofs which are straight from end to end, reported getting 400 heats in a campaign. The superintendent of this plant expressed the opinion that he would not get so many if his roof were sloped.

Recovery and Replacing of Checker Brick

PRACTICE in one plant was reported to be the recovery of about half the checker brick on a general repair. All of the brick are taken out and the new brick, half the total amount, are placed in the bottom. This results in scrapping at each repair the brick which have been used twice; that is, those which were put new into the bottom of a chamber and on the next repair into the top. This has to do with the air chamber only, as the gas chamber is built all of old brick.

Another plant, which reports 60 per cent recovery of the brick, with a single regenerator chamber at each end, takes all of the brick out each time. In this case, the new brick are placed on the top and the old brick on the bottom.

Still another plant takes out and discards the four top rows of brick after 150 to 200 heats, and scrapes and cleans all of the rest which need it. In rebuilding, the old brick are placed on top. Use of a brick-cleaning machine was reported to make it possible to straighten up brick which otherwise could not be put back into service. This gives a much better recovery of the brick.

Loftus brick, used in one plant, were reported to give about 300 heats; then the top three or four courses—the range being from one course to seven—are taken out and replaced with new. Loftus brick were stated in one case to be no improvement over the standard 4½ x 4½ x 10½-in.

Reporting for a casting plant, one man stated that he was making about

500 heats to the campaign and was putting most of the brick back in again. He expressed the opinion that some of these brick have gone through as many as 4500 heats.

Peterson brick, as indicated in the sketch, were reported to give a considerably greater bulk of brick in a given checker space than with the usual rectangular brick, and to give smaller horizontal openings. These brick, as the sketch shows, have the lower corners cut off so that they fit into each other more closely than do the rectangular units, making the openings smaller than with straight brick.

Inspection of Ladle Trunnions, Cable and Chains

SAFETY in handling heats of steel of 100 to 150 tons was discussed in some detail, with regard both to the size of trunnion on the ladle and inspection and renewal of the cables or chains on the crane. Such inspection is made in one plant regularly every four months, regardless of the rate of operation. Another plant makes this inspection every three months at a regular date. In still another case the cables are changed every six or seven months on the basis of the tonnage which has been handled. Another plant changes the cables when they begin to show signs of stretching. A stretch of ⅛ in. in a 7-in. length can be determined readily, and these changes occur about once a year.

Change of cables yearly was reported by another plant, each crane having handled about 200,000 tons of ingots during that interval. This plant reported having had trouble some years ago with a cast steel hook, which cracked. The plant has now standardized on laminated hooks made of steel plate for all ladle cranes. Another plant of the same company, which makes a practice of changing the cable yearly, had a narrow escape from an accident some time ago. One of the main cables broke, but the craneman saw it begin to unravel and was able to set the loaded ladle down by aid of the safety cable without spilling any steel.

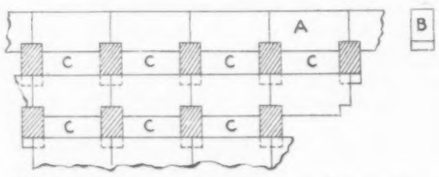
Several Breakages Reported

Another case was reported where weekly inspection of cables is in vogue. In this instance, a cast steel hook broke and the ladle came down. It did not tip over, however, and was picked up and the steel poured by means of another crane. This heat was dropped about 5 ft. straight down, as the second hook broke immediately after the first one let go. There was no running stopper.

One plant had a less fortunate experience, in having a cast steel hook break and tip the ladle over into the pit. In another case the drum shaft on the crane broke and dropped the ladle without tipping it over. This steel froze in the ladle, as it was out of reach of the other crane. In another case the U-bolt holding the cable broke and dropped the ladle, with the result that the heat was lost.

Trunnion Diameters

Trunnions 10 in. in diameter with 60-ton heats are used in one plant. In another case 10½-in. trunnions were put on 100-ton ladles and are now handling 145-ton heats. Still another plant uses 10-in. trunnions for 60-ton heats and 12-in. for 140 tons. Another one uses 10½-in. for 100 tons, but 12-in. diameter is used for the same size heat in a different plant. This plant has gone to nickel steel for the trunnions for 120-ton heats, in which 12-in. diameter is used, but 14-in. is being put on later ladles. This same 14-in. diameter is employed by another plant with heats of more than 100 tons in each ladle of steel.



Checker Brick Laid Up for Great Bulk in Limited Space. **A** and **B** are side and end views. The openings **C C** are smaller than with straight brick

Inspection of trunnions is customary at frequent intervals in one plant, beginning with a wash with coal oil. Hair-line cracks have been found in some cases on the top sides, due to hot slag running over the edge of the ladle. When these ladles were remade to avoid this trouble the cracks stopped appearing. Some trunnions which were broken have been removed and the cracks were found to be pretty deep. In another plant, where 14-in. trunnions are used, they are inspected daily by the steel mill force and monthly by the mechanical force.

Stopper Heads of Graphite and Clay

No report of the use of stopper heads of combined graphite and clay was made from any American plant. William D. Pugh, however, of the English Steel Corporation, Sheffield, reported using a nozzle of magnesite and clay, the latter being at the bottom. In this case pouring is done through a box; hence, the speed of pouring does not make much difference. His plant has found, however, that for high-manganese steel—13 per cent or so—a magnesite nozzle is the only one which will stand up. Clay used here cuts out too rapidly.

Lining and Drying Ladles

DRYING with oil, after lining and also at weekends, was reported in one castings plant to be all the heating the ladles are given. They are used in such rotation that they do not lose the heat imparted to them from the steel, before being again employed. About 19 heats to the lining are obtained in 25-ton ladles used every 5 hours. Even the nozzles are not heated after being set, as the heat of the ladle is sufficient to dry them.

Another operator reports using oil for 1 hour to dry the ladle after lining, but others are using 4 to 5 hours, especially when drying with a slag pot.

Heats obtained for each lining seem to vary considerably among the different plants. In one case, where coke-oven gas is used for drying, the October average was only 14 heats of 147 tons each. In two other cases, however, where a large amount of soft steel is made, as much as 25 heats is the average.

Circular clay brick are used in one of these cases on a ladle of 100 tons capacity, in which the steel is tapped at a temperature in excess of 3000 deg. This is for bottom pouring practice from a 3-in. nozzle and about 12 in. of slag is carried on top of the steel. Pouring of 24 ingots in a group takes about 30 min. In this same plant, with a different type of brick, only 12 heats were obtained, but sometimes with the present arrangement as many as 35 heats are made, with the aid of a patch after the first half of this run. This lining is allowed to wear away about 3 in. before a relining is made.

Desirable Type of Soaking Pits

NEW soaking pits, using producer gas and now about eight months old, were reported to be fitted with recuperators made of refractory material. Without definite data, the opinion was expressed that these pits take no more fuel than regenerator pits and possibly a bit less; they are causing no trouble. They give a more uniform heat from one side to the other than do the regenerator type, but the heat is less uniform top to bottom.

While the steel in these pits is washed a little, there is not enough of this action to cause difficulty in rolling. It is given a long soak because of the difference between top and bottom temperatures, and it heats a little faster than does the regenerator type. The ingots used are 20 x 22 in. and weigh 7000 lb. Eight are put in a pit and they are heated from cold steel in about 8 hours.

Recuperator-Type Pits

A fuel engineer reported that the tops of ingots in the recuperator-type pits heat much faster than the bottoms; consequently, it is practice to reduce the gas for a period to equalize the temperature. Reduction of the flame temperature results in more uniform heating.

Better control of heating conditions in recuperator types was reported by one operator because of the fact that each hole has a separate valve. The same condition was reported for furnaces with Isley control.

Confidence Restored Says President

Message to Congress Urges Public Building Works, Road Construction, Canalization of Waterways, Quick Action on Tariff and Income Tax Reduction

WASHINGTON, Dec. 4.—Devoted to a wide range of national and international subjects and making recommendations for legislation concerning many of them, including tax reduction of $160,000,000 for the calendar year 1930, President Hoover, in a message of approximately 11,000 words read at the opening of the second session of the Seventy-first Congress today, expressed the conviction that confidence has been reestablished. He declared that a very large degree of industrial unemployment and suffering has been prevented by the measures taken by voluntary cooperation between the Government and business institutions. Agricultural prices were declared to have reflected the returning confidence.

"The measures taken must be vigorously pursued until normal conditions are restored," he told Congress.

The recommended tax reduction program follows that given out recently by the Treasury Department. The President said, however, that in view of the uncertainty in respect of future revenues and the comparatively small size of the indicated surplus of 1931, estimated at about $123,000,000, relief should take the form of a provisional revision of tax rates.

"I recommend that the normal income tax rates applicable to the income of individuals for the calendar year 1929 be reduced from 5, 3 and 1½ per cent, to 4, 2 and ½ per cent, and that the tax on the income of corporations for the calendar year 1929 be reduced from 12 to 11 per cent," said the President. "It is estimated that this will result in a reduction of $160,000,000 in income taxes to be collected during the calendar year 1930. The loss in revenue will be divided approximately equally between the fiscal years 1930 and 1931. Such a program will give a measure of tax relief to the maximum number of taxpayers with relatively larger benefits to taxpayers with small or moderate incomes." Chairman Hawley, Ways and Means Committee, introduced a tax reduction bill in the House on Monday in line with the President's recommendation.

Asks for Early Action on Tariff

In pursuing his limited tariff revision program, President Hoover told Congress it would be most helpful if action should be taken at an early moment, more especially at a time when business and agriculture are both cooperating to minimize future uncertainties. It is just, he said, that they should know what the rates are to be.

No Conflict of Regional Interests

The President declared that there is no fundamental conflict between the interests of the farmer and the worker. Lowering of the standards of living of either was said to tend to destroy the other. The prosperity of one was held to rest upon the well-being of the other. Nor is there any real conflict between the East and the West or the North and the South in the United States, it was said. The complete interlocking of economic dependence, the common striving for social and spiritual progress, "our heritage as Americans and the infinite web of national sentiment, have created a solidarity in a great people unparalleled in all human history," the President declared. "These invisible bonds should not and can not be shattered by differences of opinion growing out of discussion of a tariff."

Public Building Work Urged

Taking up the subject of public buildings, the President recommended that consideration should be given to the extension of authorization both for the country at large and for the District of Columbia again distributed over a term of years. It was stated that a survey of the need in both categories has been made by the Secretary of the Treasury and the Postmaster General. It would be helpful, the President said, in the present economic situation if such steps were taken as would enable early construction work.

The President explained in opening discussion of the subject that under the provisions of various acts of Congress $300,000,000 has been authorized for public buildings and the land upon which to construct them, being $75,000,000 for the District of Columbia and $225,000,000 for the country at large. Excluding $25,000,000, which is for the acquisition of land in the so-called "triangle" in Washington, this public building legislation, the President pointed out, provides for a five-year program for the District of Columbia and an eight or nine-year program for the country at large. Of this sum, approximately $27,400,000 was expended to June 30 last, of which $11,400,000 has been expended in the District and $16,000,000 outside.

Treating the subject of the waterways and flood control, the President said that the development of inland waterways has received new impulse from the completion during the year of the canalization of the Ohio to a uniform depth of 9-ft. The development of other segments of the Mississippi system should be expedited, he said, and with this in view he recommended an increase in appropriations for rivers and harbors from $50,000,000 to $55,000,000 per annum, which, together with about $4,000,000 per annum released by completion of the Ohio, should make available, after providing for other river and harbor works, $25,000,000 to $30,000,000 per annum for the Mississippi system and thus bring it to early completion.

Road Program 50,000 Miles a Year

Dealing with highways, the President said that while proper planning should materially reduce the listed mileage of public roads, particularly in the agricultural districts, and turn these roads back to useful purposes, it is evident that road construction must be a long-continued program. Progress in improvement, the President said, is about 50,000 miles of all types per annum, of which some 12,000 miles are of the more durable type. The total expenditures of Federal, State and local governments last year for construction and maintenance, it was stated, assumed the huge total of $1,660,000,000.

"Federal aid in the construction of the highway system in conjunction with the States has proved to be beneficial and stimulating," President Hoover declared. "We must ultimately give consideration to the increase of our contribution to these systems, particularly with a view to stimulating the improvement of farm-to-market roads."

Progress in Civil Aeronautics

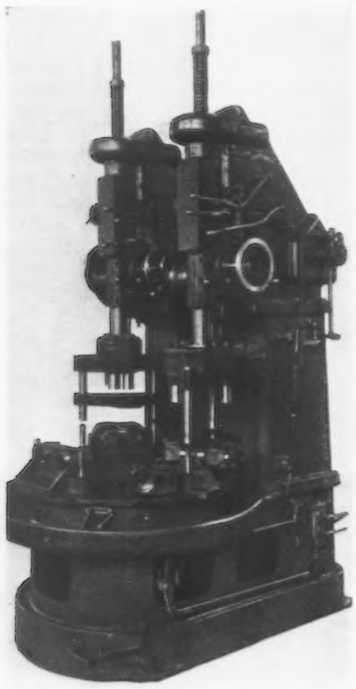
During the past year progress in civil aeronautics, the President said, has been remarkable. Government-improved airways now exceed 25,000 miles, more than 14,000 miles of which will be lighted and equipped for night-flying operations by the close of the current year, it was stated. There are now 1000 commercial and municipal airports in operation with an additional 1200 proposed for early development, the President pointed out.

"Through this assistance, the Nation is building a sound aviation system, operated by private enterprise," Presi-

(*Concluded on page* 1565)

Production Gang Drill with Hydraulic Indexing Table

A NEW two-spindle production gang drilling machine having a one-piece base and built-in rotating hydraulically controlled table has been placed on the market by the Barnes Drill Co., Rockford, Ill. The table may be of three or four-station type. The entire hydraulic mechanism is inclosed within the frame of the machine.



The Hydraulic Indexing Three-Station Rotating Table with Foot Control Is a Feature. The table has a wide chip trough and a pusher which sweeps chips into a receptacle at the rear

Other new features include inclosing the spindle sleeve and spindle between the upper crown-gear housing and the spindle sleeve bearing in each gang head. This construction eliminates the possibility of chips getting on the spindle sleeve and scoring its bearing, and makes possible the self-oiling of the spindle in its sleeve. There is a split bearing for the spindle sleeve, the bearing cap being made of Gunite metal. The spindles and sleeves are made of Nitralloy, and are heat treated by the nitriding process after machining and grinding. The nitrided case penetrates some 1/32 in. deep, and provides an unusually hard surface. This heat treatment makes it possible to apply roller bearings in recesses in each end of the spindle sleeves, the rollers making contact directly on the spindle and the sleeve recesses, with no case or raceways for the rollers. In this way the overall diameter of the spindle sleeve is kept at a minimum.

Another new feature is the sweeper fastened to the under section of the rotating table. This device pushes the chips into a steel pan at the rear, the pan being perforated so that the coolant may pass into the reservoir base of the machine. The chips are left in this receptacle, which may be emptied conveniently by sliding it out from the rear of the gang column.

The speed-change transmission and the spiral crown gears have Timken taper roller bearings, while the drive shaft and handwheel shaft have radial ball bearings.

The first spindle of the machine illustrated is equipped with cam feed, giving rapid approach, then feed at a predetermined rate, dwell for facing, and a quick return. The second spindle has a similar cam feed, adaptable both for reaming and tapping, according to the set-up. Two of the pieces shown are bored simultaneously in the first station under multiple heads equipped with guide bars, while others are being reamed in the second station or in some operations tapped.

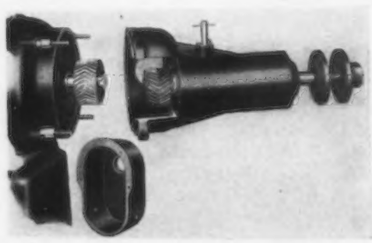
The machine shown is equipped with six-splined spindles and has drilling capacity of 2 in. in mild steel. Each gang head swings 24 in. and the spindles are spaced 28 in. center to center. The diameter of the master indexing table is 54 in. It requires only about 4 sec. to hydraulically index the table, and when the table has been indexed the hydraulic mechanism automatically actuates the throwing of the clutches and simultaneously starts the spindles upon another cycle of operations. The duty of the operator is merely to reload the spare station and actuate the foot pedal.

Polishing Lathe Has Herringbone Gear Drive

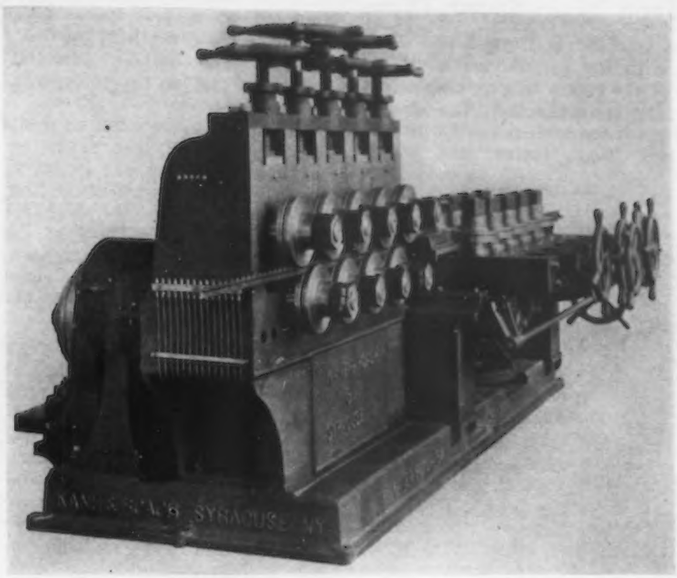
USE of continuous-tooth herringbone gears is a feature of a new motor-driven polishing lathe manufactured by the Mitchell Engineering Co., Springfield, Ohio, and marketed by Frederic B. Stevens, Inc., Larned and Third Streets, Detroit. The teeth of the gears are cut at a 40-deg. helical angle to assure quiet operation and maximum tooth contact. These gears have 2-in. width of face and are capable of transmitting 25 hp.

Each spindle bearing housing, with spindle and bearings, is an independent unit that can be removed without disturbing the motor or motor bearings. The motor shaft is carried on two ball bearings independent from the spindle bearings, an arrangement intended to eliminate undue strain and vibration from the motor bearings and to eliminate the possibility of damage to the motor by the rotor striking the fields or stator should the spindle bearings wear out. Each spindle is mounted on two ball bearings. Driving gears are of bronze, while the driven gears, on the spindles, are of steel. The former are keyed to the motor shaft by means of a feather key which permits the rotor to float to its magnetic center. Gears are completely incased and run in oil.

One spindle may be operated at one speed and the other spindle at a different speed. Eight spindle speeds ranging from 1800 to 3000 r.p.m. are obtainable. The spindles are well to the front of the machine, giving a straight-line front, and the length of the spindles overall is 56 in. They are 2 in. in diameter in the bearings and 1, 1¼ or 1½ in. in diameter between flanges. The distance between wheels is 45 in. The distance from the tight flange to the side of the machine is 16½ in. A 3, 5, 7½ or 10-hp. inclosed fan-cooled motor is employed. The size of the base at the floor is 20 x 22 in. The net weight of the machine is 700 lb.



EACH Spindle, with Spindle and Bearings, Is an Independent Unit, as Shown Above. This unit can be removed without disturbing the motor or motor bearings



New Line of Combination Roll Straighteners

COMBINATION vertical and horizontal roll straighteners are now being built by Kane & Roach, Inc., Syracuse, N. Y., in seven sizes, comparable in capacity to the corresponding sizes of the company's eight-roll straighteners. Both the horizontal and the vertical roll shaft units are furnished with 8, 10, 12 or 16 rolls each, and can be supplied in any combination of straightening units.

These machines are designed for use where a high degree of accuracy and straightness is required, the combination of horizontal and vertical rolls enabling a larger percentage of material to be straightened within the limits required in one pass through the rolls. Roll shafts are of chrome-manganese steel and are accurately ground. Reduction and drive gears, also of alloy steel, have cut teeth, and where necessary they are heat treated. They run in oil-tight gear boxes. Drive pinions are cut from the solid and are heat treated and ground. Alemite system of lubrication is regularly furnished, but other systems can be furnished.

Delivery speeds of these machines range from 60 to 300 ft. per min. The rolls are designed for handling rounds, flats, squares, angles, U-bars, hexagons, octagons, channels, I-beams, rails, pipe, and for other special shapes.

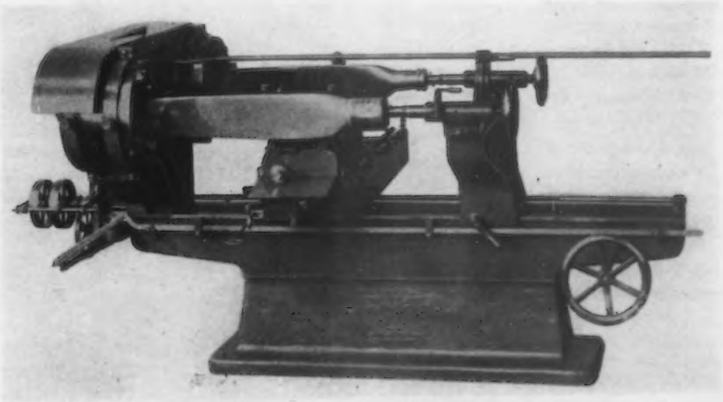
Lathe for Wood and Aluminum Airplane Propellers

FOR turning the flat winding portion of aluminum airplane propellers, wood blade propellers and struts the Defiance Machine Works, Defiance, Ohio, is offering the propeller turning lathe here pictured. This machine, designated as the No. 613, can also be used for the production of other irregular-shaped pieces not exceeding 5 ft. in length and 12 m. in diameter. It is an adaptation of the company's copying lathe which produces facsimiles of the models used, producing both right and left-hand pieces from the same model. By simple adjustment either end of the work or the entire piece can be made larger or smaller than the model.

The screw feeding mechanism, which controls the cutter-head carriage, is arranged to feed from right to left and vice versa or in one direction only. It has five changes of feed, from ⅛ in. to ⅜ in. to each revolution of the work. It can be started or stopped instantly at any position of the cut. At the lowest rate of feed it will turn 2½ in. per min. and at the highest rate 13 in. per min.

When turning aluminum alloy, a 12-in. diameter 1⅝ in. circle nose-type special-tooth milling cutter is used. This is mounted on the sliding frame and supported by the carriage which travels across the path of the material, being turned by means of a heavy feed screw driven by double friction pulleys. The feed is engaged by means of a convenient hand lever, and is disengaged automatically at the end of the cut. A hollow chuck is supplied on both pattern and turning sides of the machine. At the tailstock end the propeller is held with a center provided with ball bearing thrusts.

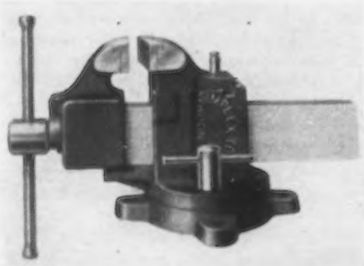
Equipment includes a milling cutter with a tracing roll, and a countershaft. The machine occupies a floor space of 76 x 120 in. and weighs 4260 lb., net.



Although Designed for Propeller Blades, the Machine Can Be Used for Other Irregular-Shaped Parts

Vise With Back Jaw That Swivels

WITH the back jaw made in two parts, the top member of which swivels, the vise here illustrated is adapted for holding irregular-shaped pieces. When the swiveling feature is not desired, the top member may be locked to the back jaw by a pin.



The Top Part of the Back Jaw Is Free to Swivel, But It May Be Locked When the Swiveling Feature Is Not Needed

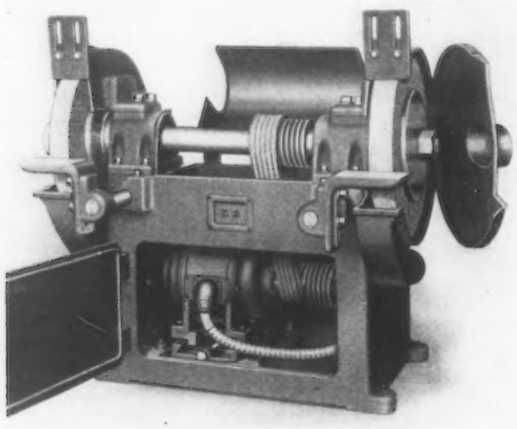
This vise, a product of the Simplex Tool Co., Woonsocket, R. I., is made with a steel slide, the sliding member of the front jaw being machined out of a solid steel bar. The nut that operates the vise screw is designed so that it cannot lift up at the back, this avoids binding of the screw which would limit the gripping power and make both the screw and the nut susceptible to breakage. The removable jaw inserts are doweled, as well as screwed on.

The combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Institute for October were 7726 tons.

Snagging Grinder Built in Single and Multi-Speed Types

SINGLE and multiple-speed, high-speed snagging grinders equipped with Texrope drives have been added to the line of the Hisey-Wolf Machine Co., Cincinnati.

The single-speed machine is built in three sizes, with 24, 20 and 18-in. diameter wheels and spindle speeds of 1550, 1800 and 2000 r.p.m., respectively. It is recommended for use in banks of three, or multiples thereof, so that as the grinding wheels become worn they can be transferred to machines operating at higher spindle speeds.



THE Drive Is by Texrope from the Motor in the Base. A safety device assures that the speed of the multi-speed grinder will not go below 7500 ft. per min. nor above 9500 ft. per min.

Equipped with a 10-hp. motor, the multi-speed machine is designed to use a 24-in. wheel operating at 9500 surface ft. per min. When the wheel is worn to 20 in. the spindle speed may be increased to 1800 r.p.m. by moving the wheel guards back to permit the safety device to be shifted and the Texrope belts to be transferred to the smaller driven pulley. With the belt on the smaller pulley the wheel speed is raised to 9500 surface ft. per min. The combination speed-change safety device automatically assures that the wheel speed will not drop below 7500 surface ft. per min., nor be increased above 9500 ft. per min., the maximum safe speed.

The motor is ball bearing equipped. It is mounted on a sliding base and is moved backward and forward by means of a screw to secure proper belt tension and accurate alinement of the motor. The motor starter is incased in a steel cabinet inside of the column, as a protection against dirt and grit, and is accessible through the large front door. Special attention has been paid to mounting the wheel guards, which are made of heavy boiler plate. The guard doors are hinged to facilitate changing wheels and the guards are adjustable to conform to wheel wear. Bearing boxes are keyed to the column and the spindle and bearing housings are assembled as a unit. The spindle is made of heat-treated chrome-nickel steel and runs in oversize ball bearings at each end, Timken bearings being optional. A heavy adjustable steel chip breaker is mounted on each wheel guard.

The machine is rugged and compact, with the spindle mounted forward of the center to give ample foot room for the operator. The single-speed machines are equipped with a 5, 7½ and 10-hp. motor, and weigh 2200, 2325 and 2430 lb. respectively. The weight of the multi-speed grinder is 2525 lb.

Production Drilling Machine

EDLUND MACHINERY CO., INC., Cortland, N. Y., has announced the manufacture of a 24-in production drilling machine capable of drilling 1½ in. diameter holes in steel. This machine, known as No. 1A in the company's line, may be built up to four spindles and may have riser blocks, if required. Hardened steel change gears, broached with two keys to avoid loose parts, are used. The jackshaft which carries the large change gear also carries a spiral bevel pinion which drives a gear mounted on a four-spline broached sleeve. This in turn drives the spindle. The spindle assembly is similar to that on the company's No. 4B machine.

The motor is mounted on a sliding bracket so that it can easily be removed and another put in its place. The necessary adjustments to line the motor shaft and the drive shaft can be made without the use of shims. The motor is connected to the drive shaft through a flexible coupling which takes care of any slight inaccuracy of alinement.

The power feed is driven through a train of gears with the change gears at the top, so that feeds ranging from 0.006 to 0.028 in. can be obtained. The sliding arm and power feed worm gear box assemblies are the same as on the company's No. 4B machine. The machine is open in the back to permit the use of extra counterweights for multiple head drilling. These weights can be taken off or put on as required. When a coolant system is desired, a bracket carrying an independent motor-driven pump is mounted on the side of the base. The machine is furnished with either hand or power feed, but not with tapping attachments. Spindles may have either No. 3 or No. 4 Morse tapers and may be flange quilled, if required.

Insulated Top Co., 1035 Fulton Building, Pittsburgh, has sold to the Jones & Laughlin Steel Corporation the right to use its patents for the manufacture of hot tops at its three plants. The Jones & Laughlin company has been manufacturing and using these tops on a royalty basis at its South Side Works and has recently completed a new plant at Aliquippa to supply its steel making department there.

EACH Spindle Has Its Own Motor Which Is Mounted on a Sliding Bracket. Motors may be removed and replaced conveniently and alinement of motor and drive shafts made without the use of shims. A flexible coupling takes care of any slight misalinement

Bethlehem Buys Pacific Coast Plants

Acquires Control of Pacific Coast Steel Co. and Southern California Iron & Steel Co.

THE Bethlehem Steel Corporation has announced the purchase of the Pacific Coast Steel Co. and the Southern California Iron & Steel Co., and thereby follows the lead of the United States Steel Corporation in extending its operations to the Pacific Coast. Purchase of the Columbia Steel Corporation of California by the United States Steel Corporation was announced a few weeks ago.

President Eugene G. Grace of the Bethlehem company made the following announcement at San Francisco, where he is completing arrangements for the transfer of properties to Bethlehem control:

"Through one of its subsidiaries, Bethlehem has entered into agreements covering the acquisition of all the properties and assets of Pacific Coast Steel Co. and Southern California Iron & Steel Co. The properties to be acquired include steel manufacturing plants located at South San Francisco and Los Angeles, Cal., and Seattle, Wash. The plants have a steel ingot capacity of 380,000 gross tons per year and produce billets, merchant and reinforcing bars, light structural shapes, transmission towers, universal plates, light rails, tie plates, splice bars, forgings, bolts, nuts and rivets, and other miscellaneous steel products.

"The Bethlehem officials for some years past have studied the steel situation on the Pacific Coast with a view to establishing manufacturing plants in that rapidly growing section of the country. The properties to be acquired will be operated through a separate subsidiary company having an active management with headquarters on the Pacific Coast. It will be Bethlehem's policy to develop the properties to the fullest extent for local and economic production, supplementing this production with products shipped by water from Bethlehem's eastern steel plants. With this combination of resources and opportunities, Bethlehem will be able more advantageously and effectively to serve the Pacific Coast territory with a full line of steel products."

The Pacific Coast Steel Co., which owned the entire capital stock of the Southern California Iron & Steel Co., was formed in 1909. It recently completed a new bolt, nut and rivet plant. Its capital stock consists of $3,000,000 in preferred stock and $3,000,000 in common stock.

The Southern California Iron & Steel Co. has its plant at Huntington Park, Cal. It produces alloy steel and bolts, nuts and rivets, capacity for the latter being 4000 tons.

Industrial Conference at Washington

Meeting Called by Chamber of Commerce to Consider Ways of Keeping Business on Even Keel

WASHINGTON, DEC. 3.—Prominent men in the iron and steel, machinery, mining and metallurgical and construction industries will attend the conference here on Thursday of the present week called by the Chamber of Commerce of the United States at the request of President Hoover, to cooperate in mobilizing the industrial and commercial agencies of the country in the interests of sustained business activity and employment. The meeting will be held at the Chamber headquarters, and, according to responses received, will be attended by approximately 250 business men of 32 groups, among them many trade association executives.

President Hoover will open the conference. From it may grow some plan for a continuing organization as the means of contact between Government and business and as the central agency to help each line of industry keep in step with others, according the notice sent out by Julius Barnes, chairman of the board of directors, and William Butterworth, president of the National Chamber. The conference will be asked to select an executive committee or council which may be made permanent.

Representatives of the different groups will be asked to review existing conditions and prospects and appraise the possibilities for wider cooperation on the side of business itself and between business and Government "in advancing the national economic welfare and keeping business on an even keel." The conference will receive the cooperation of official agencies, particularly the Department of Commerce, which will be represented by Secretary R. P. Lamont and Assistant Secretary Julius Klein.

Among those who have accepted invitations to attend the conference are:

James A. Campbell, president, Youngstown Sheet & Tube Co., Youngstown, Ohio; L. E. Block, chairman, Inland Steel Co., Chicago; W. W. Coleman, president and chairman, Bucyrus-Erie Co., South Milwaukee, Wis.; H. G. Dalton, Pickands, Mather & Co., Cleveland; H. B. Hirsch, Belmont Iron Works, Philadelphia; Carl A. Johnson, president, National Machine Tool Builders' Association; Lloyd Kimbrough, president, Indiana Bridge Co., Muncie, Ind.; A. E. McKinstry, president, National Association of Farm Equipment Manufacturers, Chicago; Charles Piez, chairman, Link-Belt Co., Chicago; George E. J. Pistor, Hay Foundry & Iron Works, New York; H. T. Richardson, president, National Boiler and Radiator Manufacturers' Association; Ralph M. Roosevelt, president, American Zinc Institute, New York; Harold G. Smith, president, National Metal Trades Association, Chicago; H. G. Smith, president, National Council of American Shipbuilders, New York; George M. Verity, president, American Rolling Mill Co., Middletown, Ohio.

E. A. S. Clarke, New York, secretary, American Iron and Steel Institute; Owen D. Young, New York, chairman, General Electric Co.; Charles M. Schwab, New York, president, American Iron and Steel Institute; Charles F. Abbott, New York, executive director, American Institute of Steel Construction, Inc.; A. J. Lockwood, Philadelphia, president, American Steel and Heavy Hardware Association; G. H. Weller, New York, manager, Forging Manufacturers' Association; W. W. Nichols, New York, president, Machinery Builders' Society; J. A. Farrell, New York, president, United States Steel Corporation; E. G. Grace, New York, president, Bethlehem Steel Corporation; Leonard S. Horner, New Haven, Conn., president, Niles-Bement-Pond Co.; V. G. Iden, New York, statistician, American Institute of Steel Construction, Inc.; F. J. Kulas, Cleveland, president, Otis Steel Co.; George M. Laughlin, Pittsburgh, vice-president, Jones & Laughlin Steel Corporation; A. W. Robertson, East Pittsburgh, Pa., chairman, Westinghouse Electric & Mfg. Co.; W. D. Sayle, Cleveland, president, Cleveland Crane & Engineering Co.; Henry D. Sharpe, Providence, R. I., president, Brown & Sharpe Mfg. Co.; Gerard Swope, New York, president, General Electric Co.; Myron C. Taylor, New York, chairman, finance committee, United States Steel Corporation; John A. Topping, New York, chairman, Republic Iron & Steel Co.

Chicago Employment Down Only Slightly to Oct. 15

Manufacturing industries of the Seventh Federal Reserve District report to the Federal Reserve Bank of Chicago an aggregate loss of 1.1 per cent in the volume of employment for the period of Sept. 15 to Oct. 15. This is virtually the first decline in industrial employment of the district since January, when a drop of 0.7 per cent was shown.

With the exception of June and July, when the recessions were very slight, the trend in employment has been uniformly upward during the past year, and on Oct. 15 the volume was about 5 per cent higher than on the corresponding date in 1928.

Metals and metal products lead in the gain, with employment 10 per cent above a year ago and about the same increase in payrolls. Number of wage earners on Oct. 15, as compared with Sept. 15, was 0.5 per cent less for the metals and metal products industrial group, 0.5 per cent in vehicle manufacturing plants and 2.2 per cent less in the chemical products group.

Metal Inventories Well Below 1920 Level

Illinois Manufacturers' Association Finds that Stocks of All Goods on Nov. 1 Were Comparatively Low

DATA compiled from answers to a questionnaire sent out by the Illinois Manufacturers' Association to its members show that the percentage of raw materials on hand, based on annual sales, on Nov. 1, 1929, was approximately one-half of the average on Oct. 1, 1920.

Companies stocking iron, steel and foundry products report percentage of raw materials on hand to annual sales on Nov. 1, 1929, at 3.35 compared with 7.07 per cent on Oct. 1, 1920. Corresponding figures for metal products are 5.37 per cent and 11.09 per cent, and for machinery 9.51 per cent and 19.90 per cent.

Percentage of total inventory on hand to sales for iron, steel and foundry products on Nov. 1, 1929, was 11.56 per cent and on Oct. 1, 1920, 12.63 per cent. The corresponding figures for metal products are 15.01 per cent and 27.60 per cent, and for machinery 19.67 per cent and 26.54 per cent.

	Percentage of Raw Materials on Hand to Annual Sales		Percentage of Total Inventory on Hand to Sales	
	1920 (Oct. 1)	1929 (Nov. 1)	1920 (Oct. 1)	1929 (Nov. 1)
Iron, steel and foundry products	7.07	3.35	12.63	11.56
Food products	7.76	4.33	9.40	7.13
Metal products	11.09	5.37	27.60	15.01
Machinery	19.90	9.51	26.54	19.67
Lumber and wood products	24.87	14.37	27.87	17.81
Printing	7.49	4.37	13.76	13.49
Clothing and textiles	12.20	3.20	19.94	13.71
Electrical specialties	8.23	3.08	26.86	14.60
Chemicals	4.31	0.56	15.51	5.45
Miscellaneous	11.09	6.43	21.91	13.85
Averages	11.40	5.46	20.20	13.23

The principal reasons advanced for reduction in inventory by those answering the questionnaire were improved transportation conditions and better coordination among purchasing, production and distribution departments.

The complete table prepared by the association is given herewith.

Will Buy Equipment for South African Plant

Further particulars have been learned about the iron and steel plant to be built at Pretoria, South Africa, for the South African Iron & Steel Industrial Corporation, Ltd. The site is 4500 ft. above sea level. The plant will consist of by-product coke ovens, two blast furnaces, an open-hearth steel plant and rolling mills, all complete with power house and accessory departments. Ore and coal are available within easy reach of the site. The initial production is to be about 200,000 tons a year but the plant will be laid out for easy expansion.

The International Construction Co., Ltd., 56 Kingsway, W.C.2, London, England, is heading up the committee of consulting engineers for the work, and S. L. Bengtson, managing director of that company, is at present in the United States. He will sail for Europe on Dec. 14, but will be at the offices of Barclays Bank (Dominion Colonial and Overseas Bank), 44 Beaver Street, New York, on Dec. 12 and 13, where specifications for the blast furnaces, open-hearth plant and rolling mills may be obtained.

Three sets of the complete specification for each department will be issued against a deposit of £500, to be refunded to bonafide tenderers for at least one of the sections. Bids must be made by April 12, 1930.

The rolling mill equipment will include besides the blooming mill, a rail and structural mill, a medium structural mill, plate mill and merchant and rod mill, together with soaking pits and furnaces, gas producers, etc.

Blast Furnace Merger To Be Completed Dec. 9

Details of plans for the merger of the blast furnace and coke oven properties of the By-Products Coke Corporation, Chicago; Toledo Furnace Co., Toledo, Ohio; Perry Furnace Co., Erie, Pa., and Zenith Furnace Co., Duluth, Minn., will be worked out at a special meeting of the stockholders of the By-Products Coke Corporation that has been called for Dec. 9 to consider changing the company's name and to approve contracts for the acquisition of the properties of the other furnace companies.

No new financing will be required. Stock of the Perry Furnace Co. is to be acquired in exchange for 588,419 shares of By-Products common stock; assets of the Toledo Furnace Co. for 549,161 shares and assumption of that company's obligations, and property and assets of the Zenith Furnace Co. for 102,375 shares and assumption of that company's obligations.

With common stock now outstanding, there will be 2,000,000 shares issued of the 2,500,000 shares authorized. Stockholders will also consider fixing the amount which the capital stock shall represent on the balance sheet and giving directors authority to sell unissued stock and fix the price therefor.

Some Exhibits at New York Power Show

Included among the many exhibits shown at the eighth annual exposition of power and mechanical engineering at the Grand Central Palace, New York, Dec. 2 to 7, were a number of chain transmission devices. One of these, by the Morse Chain Co., Ithaca, N. Y., featured a silent chain drive with flexible coupling, single, double and triple-reduction speed reducers and both ring and disk oiling devices.

Through the medium of a Neon lamp synchronized with the pitch travel of a chain drive in operation, a novel stroboscope effect permitted observers to see the rocker action of the joint. Another unit in operation under glass is a drive featuring a ring oiler. This delivers clean oil to the moving chain without the splash system.

The Diamond Chain & Mfg. Co., Indianapolis, showed a high-speed drive in operation in a glass inclosure. Running at 3600 r.p.m., this quadruple-strand unit demonstrated its smoothness and quietness in operation. Another exhibit consists of 11 drives using chain from ¾ in. pitch up to 2½ in. pitch at a speed of 65 r.p.m.

Carnegie to Add 10-In. Bar Mill at McDonald

The Carnegie Steel Co. has completed engineering plans for a 10-in. bar mill at its McDonald works in Trumbull County, Ohio, which will give it a total of 11 bar and hoop mills at this property. Work is to start at an early date and the mill is scheduled to be completed in 1931. The company also plans changes to its 12-in. bar mill at the Upper Union mills to enlarge the capacity.

Finding FeO in Steel

Dr. C. H. Herty, Jr., has called attention to two errors in our issue of Nov. 21 in connection with the Open-Hearth Committee report. On page 1383 the method of obtaining FeO from Al_2O_3 should read, "If we multiply the amount of Al_2O_3 from analysis by 2.11 we obtain the FeO content of the steel."

On page 1384, regarding soda ash used in the Aston process, this should read, "This is put into the cupola metal ladle before carrying it to the converter."

Harnischfeger Corporation, Milwaukee, has declared an initial quarterly dividend of 45c. on its common stock, payable Jan. 1 to stock of record Dec. 15. The regular $1.75 quarterly dividend on the preferred stock was also declared. Earnings of the company are expected to equal $4 a share; as compared with $2.81 in 1928.

This Issue in Brief

Eliminates hand labor in quenching small parts by using containers having a lug which is gripped by tongs of overhead hoist. Containers need no longer be hooked and unhooked.—Page 1506.

* * *

Non-rusting steel discovered by German scientists, says German metallurgist. Strauss and Maurer found it in investigation of heat-resisting alloys, he says, and Krupp Works developed the proper heat treatment to make the metal workable.—Page 1512.

* * *

Saving of 20 per cent in weight of material is gained by use of upset forgings compared with hammer, hydraulic or other types, forging manufacturer estimates. And production is greatly increased, he adds.—Page 1513.

* * *

Saves fuel by heating core ovens with two unequal gas burners. Small burner holds oven to temperature when not in use. Large high-pressure burner, hooked to temperature control, is used when baking cores.—Page 1516.

* * *

Premium or bonus basis of compensation is used by less than 10 per cent of manufacturing firms investigated. Of that proportion, 99.1 per cent said the bonus cut their costs and increased employee earnings.—Page 1520.

* * *

Aluminum forgings require highly polished dies, and greater care is necessary in preparing stock for forging than in the case of steel. Forgings are heat treated at 960 deg. Fahr.—Page 1522.

* * *

Stops gas leaks from open-hearth furnace settings by use of a new plastic sealing material. Walls can expand and contract without breaking or cracking the joints.—Page 1522.

Sometimes you lose money by having holes pierced in forgings during the upsetting operation. It may pay to make the forging solid and drill the holes.—Page 1514.

* * *

Build the motor into the machine instead of applying it externally, engineer suggests. Predicts a revolution in machine design, and declares machinery builders will make electrical parts for their products, due to intimate relation of the motive power to other parts of the machine.—Page 1524.

* * *

Copper welding made easier and stronger by using deoxidized copper. But conductivity is reduced.—Page 1524.

* * *

Confidence has been reestablished, says President Hoover. But "measures taken must be vigorously pursued until normal conditions are restored," he tells Congress.—Page 1531.

* * *

Strength and toughness of gray iron are increased by molybdenum. Machinability is not notably decreased until molybdenum reaches 1.5 per cent.—Page 1508.

* * *

Increases capacity of containers used in heat treating small parts by eliminating cylindrical screen. Air circulated by fan in bottom of furnace is forced through the work, instead of through screen.—Page 1506.

* * *

Mild steel parts, with aluminum driven into surface (calorizing), will resist oxidation at temperatures up to 1650 deg.—Page 1511.

* * *

You can save money on your forgings by calling on a competent forging expert to go over new designs. A minor change may simplify die construction, increase production and reduce costs markedly.—Page 1514.

Production can be increased about 5 per cent by eliminating speed variations caused by belt slippage, says engineer. Variation may be 6 per cent above or below normal, due to stretching and temperature and humidity changes.—Page 1523.

* * *

Group incentive method of compensation has gained rapidly in past three years, investigation reveals. Automotive, heavy machinery and light machinery industries are principal users.—Page 1520.

* * *

Pressure for lower costs will not lessen, whether business gets better or worse. So now is the time to rearrange your plant for more efficient production.—Page 1538.

* * *

"Why did the steel wire break?" Failure of wires in main cables of suspension bridges is a mystery that may never be solved. Bureau of Standards' investigation may be made too late, as the evidence may even now be evaporating.—Page 1539.

* * *

Sees wide uses for new crack-proof, hammer-proof, acid-proof lacquer, which will withstand even boiling hydrochloric acid. Promises to compete with rust-proof metals.—Page 1518.

* * *

Corrosion of steel in high-pressure boilers proceeds at a negligible rate, tests reveal. Fears that high steam pressures and temperatures dangerously accelerate corrosion prove unwarranted.—Page 1525.

* * *

Sharp drop in number of blast furnaces in operation. On Dec. 1 there were 177 furnaces in blast, a net loss of 26 for the month. Average daily pig iron output for November was 106,047 tons, 8.3 per cent under October.—Page 1542.

A. I. FINDLEY
Editor

THE IRON AGE

W. W. MACON
Managing Editor

ESTABLISHED 1855

Now For Plant Revamping

THE extent that consumer buying power will be crippled by the stock market crash cannot be measured. But whether this setback proves greater or smaller than now estimated, business has an opportunity to put its house in order. Here and there manufacturers already have taken steps to rearrange plant layouts for more efficient production. Increasing numbers are on the way to replace obsolete or obsolescent equipment. A typical case, representing a community movement, is that reported from Youngstown in the news pages of this issue.

Fortunately American corporations, at least the larger ones, were never in a better cash position to undertake such a rehabilitation program.. And the assurance that they intend to go ahead with improvements is not to be interpreted as mere propaganda; it reflects a long-range view, which does not allow temporary business fluctuations to interfere with plans to keep pace with the country's growth and to meet the ever-increasing pressure for lower costs.

The President's conferences did well to direct attention to the fact that much of the business of the country is of this character and is not immediately dependent on consumer demand. As the National City Bank of New York points out, "the sponsors of such undertakings are not disturbed by a few months' dip in business, for they know that the added facilities will soon be needed." Work of this kind, moreover, will encounter no financial obstacles, thanks to large corporate cash reserves and easier money rates.

Some of these programs, notably those of the railroads, are now under way. Others may require two or three months before they can be set in motion. Meanwhile business recession may increase or diminish according to the force of factors not yet susceptible to measurement. But the projects undertaken will prove an important offsetting influence and at the same time will be economically justified. It is axiomatic that if competition is to become keener more efficient plant and equipment are needed. Likewise, if mass demand is to grow—as it surely will sooner or later—ways of making mass goods more cheaply must be found.

Throughout the first nine months of this year plant managers in a number of leading industries were under pressure to get out a maximum production. Surely many defects in layout, methods and equipment were disclosed which, under the stress of the period, could not be remedied. Now management has the opportunity to put into practice what its experience recommends. While small companies, as a rule, cannot undertake long-range programs, such as large corporations plan, they can do much to put their plants in top notch shape for the next period of business activity.

The Status Quo of Trade

EFFORTS now being made to mitigate ill effects of the stock market collapse are not intended to restore or preserve the status quo of trade for several reasons. The simplest of these, and all-sufficient, is that there was none. General trade had been engaged in a short-term swing.

What really occurred is readily remembered and is measurable by trustworthy statistics. With minor interruptions there was active and healthy trade, slowly expanding with the increase in population and increase in efficiency from late in 1922, after the slump and readjustment, until about the middle of last year. Then activity, making allowance for seasonal variation, began to increase in various lines in an unusual manner. That special activity reached its height during the second quarter of this year, and for about four months preceding the crash in the stock market a recessive tendency was plainly observable, although it was slight. Obviously it was quite insufficient to measure against the almost vertical drop in the stock market.

Steel production pursued an unusual course. Precedents had been so clear that it was regarded as almost unavoidable that July should be the low month, with August no more than a trifle better, but last year June was the low month and August was 7½ per cent above June. October made the very unusual showing of being the top month of 1928.

In the first half of this year the special swing was still more pronounced. The second half of last year made a new record for second-half steel production by 12.5 per cent, but the first half of this year made a new first-half record (with proper allowance for an odd working day) by 17.6 per cent. Both percentages, particularly the latter, were so large for these latter-day times in steel as to be unusual or abnormal.

With a swing lighter than in steel, but still plainly marked, the Federal Reserve Board's index of industrial production, manufacturing and mining, made a similar showing. During the period of slowly rising activity it advanced about two points a year, whereupon beginning with July of last year it took a special trend upward. The index is adjusted for seasonal variation and it had its peak last June, declining five points from June to September.

The state of trade during, say, the second quarter of this year was one thing, the highest. The state of trade in early October, before the stock market slump, was another and lower thing. The state of trade one year ago was another thing. All were above the points that would be indicated by constructing a general trend line for the seven years of activity we have had since trade got on its regular post-war basis.

Thus there is no particular status quo to be selected as something to be aimed at. The objective should be,

and doubtless is, to give economic laws an opportunity to work unimpeded by adverse sentimental influence.

Economic Unbalances

THE well-informed London correspondent of the *Wall Street Journal* recently communicated some facts in respect to British agriculture. More than 1,500,000 acres have gone out of cultivation during the last six years. Some farms are being sold for $30 per acre. Many cannot find buyers. More than $40,000,000 was lost last year in general farming. British farmers are in debt to the banks to the amount of $250,000,000. There has been a steady drift from the farms to the towns. At present only 7 per cent of the British people live by agriculture. The only farmers in Great Britain who are prosperous and contented are those who have gone in for intensive raising of special crops and animals. All the rest are groaning and pleading for tariff protection or direct subsidy, which the 93 per cent of non-agricultural population is quite unwilling to grant.

Substituting other numerical expressions, which would alter the statement quantitatively but not qualitatively, this summary of the position of British agriculture and its political aspirations would be an accurate description of American conditions. Naturally there are differences. Great Britain is an importer of foodstuffs. The United States an exporter. The British wheat grower complains that with his small fields and non-mechanization he can not compete with the American. The American wheat grower in turn complains of the competition of the farmers of Canada and Argentina. Here we talk of much larger quantities than they do in Great Britain. Secretary Hyde has just let us know that out of 955,000,000 acres of American farm land only 505,000,000 can be cultivated, while only 350,000,000 produce crops enough to supply domestic needs plus all that we are able to market abroad.

It is evident that the farmer everywhere is under the yoke of economic conditions and that legislation cannot cure his ills. There is little use in bestowing upon him tariff protection if he produces a surplus that must be exported and sold in competition with similar products raised elsewhere. A bounty, naked or disguised, would inevitably lead him to augment his production. If too much of a commodity be produced, with the consequence of low prices, the only corrective is curtailment by extinction of the unprofitable. The labor that is thus released should be diverted to the growing of crops that are needed or else should be attracted to the towns to engage in manufacturing. Each of those movements has been proceeding in both the United States and Britain. Increase in manufacture should result in cheapening of the goods that the farmer as well as other persons have to buy.

Evidently, however, equalization does not work in accordance with theory. The cost of living does not come down. What, then, are the obstructions? Main Street answers, Wall Street. Since the catastrophe of October and November many will not think that so good an answer as previously. The farmers cannot fail to see that the operations of the great mail order houses have done much to reduce the cost of buying. On the other hand it may be perceived that the conduct of labor unions does not reduce the cost of railroad transportation, building, anthracite coal and other essential things.

Who Knows About Wire Making?

IT will be recalled that early this year a number of wires in the main cables of a 1200-ft. suspension span under construction at Mount Hope Bay (near Providence, R. I.) was found broken at the anchorage. The bridge had been finished except for the floor slab; nevertheless it was promptly decided to dismantle the structure and re-erect with new cables, since the number of broken wires was steadily increasing. A similar course was taken on a much longer bridge across the Detroit River, not so far toward completion, because the same variety of wire was also used in this structure.

Both these rebuilt bridges have now been opened to the public, at Mount Hope too late for the summer traffic, but the Detroit bridge full nine months ahead of schedule—truly remarkable feats, reflecting the highest credit to ingenious, energetic and resourceful organizations of erectors and field engineers. Worthy of commendation, too, is the way the firms involved in the misfortune (wire maker, cable erector and bridge company) adjusted the puzzling problem of financial responsibility.

This latter matter was undoubtedly decided on a give-and-take basis, because the cause of the trouble with the bridge wire was not known—is not known even yet. Lacking such exact information, the complex relationship among the various sub-contractors could not be adjusted in any other way than on the broad basis of mutual responsibility for a safe bridge and speedy erection. It is worthy of repetition, then, that great credit is due the courageous executives who could accept a share of the inevitably large financial loss without recrimination and recourse to long and equally expensive litigation.

Now that the bridges are opened and the bills paid, the various parties in the transaction may wish to close the books. But for some silent partners in the transaction—steel wire makers and users generally, bridge engineers and metallurgists—the matter is not settled, nor will it be until a convincing reply is given to the question "Why did the steel wire break?" It is of no use to say that it was quenched-and-tempered wire instead of the patented and cold-drawn material used so satisfactorily in former bridges; prior to the commencement of the failures in the bridge the engineers (among the most competent in America) were convinced that the new material was considerably better than the old. Had the wire been satisfactory after erection, the technical world would have applauded their courage and vision in taking yet one more step ahead.

With the rubbish cleared away, it is now time for the record to be made public, for detailed investigation to get under way, in order that this problem, affecting the fundamentals of wire making and using, be satisfactorily solved. Several hypotheses have been advanced, but none of them explains all the facts fairly easily ascertainable. The wire was not made of inferior steel, since it passed as rigorous tests in process and before acceptance as would be specified for cold-

drawn wire. The wire was not abused during erection, because the erector's gang was composed of experienced, steady workers, yet the failures were concentrated at the anchorage and in a few of the many strands. The wire was not overloaded, because each wire was stressed individually and equally on erection, and the whole cable carried only a fraction of the intended weight.

The supposition that the properties of heat treated steel are evanescent is contrary to experience and metallurgical theory. Heat treated carbon steel wire is not brittle under slow loading, rapid impact or alternating loads less than the fatigue limit—witness the successful performance of millions of valve springs in our gas engines. If the zinc coating on this wire roughened the surface of the steel so that it acquired notch-brittleness, why does not the same zinc coating do the same thing to patented and cold drawn bridge wire? The same query could be raised against the suggestion that it was the acid used prior to galvanizing that really did the damage.

A large quantity of the wire from Mount Hope is now at the Bureau of Standards, sufficient for any amount of laboratory testing. Eventually we will get from that institution an impartial report on the findings, but with the sadly depleted staff now at the bureau an early report cannot be expected. Meanwhile the evidence may be evaporating, if the trouble really is hydrogen or acid brittleness (the most plausible hypothesis yet advanced). Since the wire passed rigid tests before erection in the bridge, is it not reasonable to presume that it will pass rigid tests, after dismantling, at the Bureau of Standards?

We are still of the opinion, expressed in these columns in May, that the real solution is likely to come from a more distant view of the entire process of wire making, and may readily come from some maker or user not too close to bridge wire manufacture. With that in view, two supplemental courses of action are now in order. One, the most immediate and easiest, is to publish the fullest possible account of the manufacture, treatment, tests and erection of the wire cables; not only the unsuccessful ones, but the successful ones which replaced them. This will put the facts in such form that many can read and make suggestions.

A much more fundamental matter, however, is for wire makers to start a research into wire making. So many things about a wire mill are traditional, so little has been reduced to specific data in every step of the process from green rod to finished wire, that the field of research is embarrassing by its very size and vagueness. Such a cooperative research would naturally be directed at other things than a solution of the Mount Hope problem (although this might readily be an eventual by-product). Its main aim would be to help the wire industry to fortify itself with knowledge for the revolutionary changes in the industry which are just around the corner, and to help it avoid the numerous pitfalls which waylay rapid progress—such as, for instance, the failure of heat treated bridge wire.

CORRESPONDENCE

Coke Oven Plants of Soviet Russia

To the Editor: From Leningrad, by way of Moscow and Kharkov, it is 48 hr. to the Don Bas, one of the fertile farming sections of Soviet Russia, but also one rich in coal deposits and at present the source of production in this country of nearly all its metallurgical coke. A visit to its coking plants would probably not disclose anything in the way of technical developments to excite the curiosity of one familiar with American practice, but a short description of such a visit by the writer in June and July of this year may prove of interest.

Generally the ovens are located adjacent to the coal mines and the mine tipple becomes a part of the coal preparation department. It is seldom, however, that one mine is of sufficient capacity to supply a plant, so that a part of the coal must be transported, and this is done either by aerial tramway or in the standard Russian car of 20 tons capacity.

The coals available for coking in this district occur in thin and broken seams, which lie at an angle to the horizontal and at a considerable depth below the surface. Due to the angle at which these coals are found, one shaft may cut several seams of entirely different grades and it is possible to bring coal of 18 to 20 per cent volatile matter out of the same shaft with coals averaging as high as 35 to 40 per cent. Some mines are not even equipped to segregate these different grades, so that considerable care must be exercised to insure a uniform mixture at the ovens. The ash and sulphur contents are exceedingly variable, ranging from 9 to 14 per cent ash and from 1 to 3 per cent sulphur, making washing necessary with but few exceptions. After preparation, the coal mixtures charged to the ovens will average 22 to 24 per cent volatile matter, 10½ to 11 per cent ash and 1 to 2½ per cent sulphur.

The ovens are all of European design, consisting principally of those of the Coppe type, but including also Koppers, Collin, Piette and Piron installations. Some ovens built in 1900 are still operating, but a majority of the plants still making coke were built between 1910 and 1914. Several plants were built during the late war, one at Briansk by war prisoners, but these stood idle during the revolutionary period and the years immediately following, and have only recently been put in operation. All are of fireclay brick construction, of 3 to 9 tons capacity, and operate on a 24 to 48-hr. coking time.

One feature particularly noticeable on all of these plants is the absence of coke handling or screening facilities. Coke is pushed out on either a flat or an inclined bench in front of the ovens and quenched by hose. It is then forked into railroad cars for transportation or, as was the case in many plants, into hand buggies and wheeled to the furnaces nearby. Due to the strong coking characteristics of the coal and the long coking time at which the ovens are operated the coke is blocky and unusually large. It is strong and of a good cell structure.

In line with the country's policy of industrialization and expansion of the steel industry, coke making facilities are being enlarged and the more inefficient plants abandoned. This is evidenced by 100 new Koppers ovens at Gorlovka and 90 new Otto ovens at Rutchenkov that have been operating for the past year. These plants are thoroughly modern in every respect and are well operated, the efficiencies obtained being much better than on the older installations. Four new plants are also under construction, two of Becker ovens, one of Otto, and one of Evans-Coppe.

E. H. COLLESTER
Leningrad, U. S. S. R. Freyn Engineering Co.

Buffalo Scrap Dealers Elect Officers

Scrap dealers from central and western New York and northern Pennsylvania attended a meeting of the Buffalo branch of the Institute of Scrap Iron and Steel held Tuesday at the Hotel Statler, that city. It was reported that the Buffalo chapter had contributed its quota to the $50,000 fund being raised to carry on the work of the institute during the next two years.

The following officers were elected: Charles Bock, M. Bock & Sons, Buffalo, president; first vice-president, Louis Hurwitz, Hurwitz Iron & Metal Co., Syracuse; second vice-president, Sol Frankle, Rochester Iron & Steel Co., Rochester; third vice-president, Sol Morrison, Morrison & Risman Co., Buffalo; secretary, John E. Farrell, Buffalo; treasurer, Harry Roblin, Buffalo Housewrecking & Salvage Co. Executive committee, Joseph M. Maher, Pennsylvania Wood & Iron Co., chairman; Nate Jacobs, Max Pressler, Samuel Greenfield, Terry Hanlon, Buffalo; Henry Zachs, Erie, Pa.; David Falk, Ben Rosenthal, Rochester; Abe Nathan, Utica; and Philip Roth, Syracuse.

Appointment of a board of arbitration to settle disputes between dealers and buyers of scrap iron material was discussed. David Schwartz, director of the institute, reported cooperation on the part of the mills with the new plans of the dealers.

Slight Reduction in Use of Electricity

Productive activity in the United States, measured by the monthly electrical energy consumption of 3600 scattered manufacturing plants, is reported by *Electrical World* at 134.6 for October, compared with 135.8 for September. The figures are on the basis of 100 as the average for 1923-1925 and may be compared with 129.5 in October, 1928. All the major products, with the exception of textiles, paper and pulp, rubber, chemicals and shipbuilding, show declines from September.

Metal industries dropped from 149.2 to 145.1, but still remain above the 144.6 of October, 1928. Rolling mills and steel plants, included under metal industries, declined from 152.3 to 144.8, being fractionally above the 144.7 of last year. Other metal-working plants, both ferrous and nonferrous, dropped moderately from 147.4 to 145, compared with 130.6 in October, 1928.

Automobiles, including the manufacture of parts, fell considerably below the level of a year ago. The October figure is 122.4, compared with 138.1 in the previous month and with 141.2 in October, 1928. Shipbuilding, on the other hand, is the highest it has been for many months, at 134, compared with 114.9 in September, and with only 73.8 last year.

The Week in Business

Drift of Current Financial and Economic Opinion

FEAR, the first effect of the stock market crash, is rapidly giving way to sober judgement. Pernicious rumor, given impetus by distraught nerves and overstimulated imagination, has run its course without serious result, and calm appraisal of the business outlook is now the order of the day.

For this return to sanity the country is largely indebted to President Hoover's conferences. To what extent they will also succeed in forestalling or minimizing business reaction is still an open question. As is pointed out by the National Industrial Conference Board, it would require a revolutionary change in the habits of the population completely to eliminate the ebbs and flows of business activity.

"Between the years 1885 and 1927 there were approximately 13 distinct intervals in which business activity alternately expanded and contracted," the Conference Board adds. "However, the statistical, historical and economic events which brought about these changes have seldom if ever been very much alike."

A New Kind of Business Situation

It is clear that the present situation has little in common with that of the 1920-1921 depression, but it is likewise becoming apparent that it has other characteristics, both favorable and unfavorable, that will materially affect the course of business in coming months.

Actual losses in the stock market, as well as the frozen funds of speculators who saved their margins and still hold their stocks with no prospect of early liquidation, represent a definite, although still unmeasured, curtailment of consumer purchasing power. Another complicating factor is that banks are burdened with "frozen loans." Many of them, according to E. C. Harwood, writing in the *Annalist*, lent heavily to clients on stock and bond collateral which, at present prices, is quite inadequate.

Another imponderable is the extent that consumer inventories were inflated under the dual stimulus of installment selling and Wall Street profits. "The gigantic inflation of the stock market," in the opinion of the *Commercial and Financial Chronicle*, "acted as an inordinate stimulus to trade, raising it to unnatural and fictitious proportions."

Much Business Will Go Ahead Regardless

With consumer buying power evidently hardest hit—and it is still uncertain how badly—by the Wall Street panic, the President's conferences performed a second timely service by focusing attention on the magnitude of activities that will go ahead, regardless of the current status of ultimate consumption. As is well stated by the December survey of the National City Bank of New York, "a large part of the business of the country is not immediately dependent upon buying by the general public, but on the maintenance and improvement of the industries, railroads, telephone systems, light and power plants and municipal properties.

"Undertakings such as these," it adds, "are remote from the stock market and will go forward regardless of its fluctuations. Their sponsors are not disturbed by prospects of a few months' dip in business, for they know that the added facilities will soon be needed. Of far greater importance in shaping up a big construction program is the question of cost of capital, and this is fast solving itself in a manner favorable to enterprise."

Sees Recovery by Spring

The reassuring influence of the Washington conferences, in the view of the Harvard Economic Society, is probably less important than the action of the stock market itself, which has resulted in a stupendous reduction in brokers' loans and rapid easing of money rates, including the lowering of rediscount rates at New York, Boston and Chicago. "The soundness of business conditions and the rapid easing of money," the Society declares, "indicate that even a mild depression is improbable and that what we face is probably a business recession that will terminate by spring."

Large Loss in November Iron Output

Daily Rate Less Than October by 9698 Tons or 8.3 Per Cent—Net Loss of 26 Furnaces Largest Since May, 1924

VERY sharp was the contraction in pig iron output in November. The loss in daily rate from October was 9698 gross tons or 8.3 per cent. The most recent greater loss was 14,090 tons in May, 1925, from April. In net loss of furnaces the November record is the largest since May, 1924. The loss last month was 26 furnaces while in May, five years ago, it was 46 furnaces. Even in April of that year the net loss was 40 furnaces.

Production in November was 3,181,411 tons or 106,047 tons per day for the 30 days, as compared with 3,588,118 tons or 115,745 tons per day for the 31 days in October. The loss in October from September's total was less than 1 per cent. The November output is the smallest this year and compares with 3,302,523 tons in November last year. The daily rate last month is the smallest since September, 1928, when it was 102,077 tons.

Operating Rate on Dec. 1

More drastic than the drop in daily rate was the decline in operating rate on Dec. 1. The 177 furnaces blowing on that day had an estimated operating rate of 98,450 tons per day compared with 113,600 tons per day as the estimated operating rate for the

Daily Average Production of Coke Pig Iron in the United States by Months Since Jan. 1, 1925—Gross Tons

	1925	1926	1927	1928	1929
Jan.	108,720	106,974	100,123	92,573	111,044
Feb.	114,791	104,408	105,024	100,004	114,507
Mar.	114,975	111,032	112,366	103,215	119,822
Apr.	108,632	115,004	114,074	106,183	122,087
May	94,542	112,304	109,385	105,931	125,745
June	89,115	107,844	102,988	102,733	123,908
½ year	105,039	109,660	107,351	101,763	119,564
July	85,936	103,978	95,199	99,091	122,100
Aug.	87,241	103,241	95,073	101,180	121,151
Sept.	90,873	104,543	92,498	102,077	116,585
Oct.	97,528	107,553	89,810	108,832	115,745
Nov.	100,767	107,890	88,279	110,084	106,047
Dec.	104,853	99,712	86,960	108,705	.....
Year	99,735	107,043	99,266	103,382	.....

Pig Iron Production by Districts, Gross Tons

	Nov. (30 days)	Oct. (31 days)	Sept. (30 days)	Aug. (31 days)
New York and Mass.	229,850	243,702	235,317	253,889
Lehigh Valley	73,856	84,676	82,623	88,395
Schuylkill Valley	73,321	75,303	69,373	74,871
Lower Susq. and Lebanon Valleys	35,332	37,405	37,900	37,706
Pittsburgh district	646,461	772,236	770,222	827,285
Shenango Valley	63,297	93,928	131,052	139,835
Western Pennsylvania	121,833	154,451	144,394	150,272
Maryland, Va. and Ky.	120,346	120,428	114,181	115,804
Wheeling district	105,272	130,217	125,009	130,296
Mahoning Valley	293,706	371,718	354,446	368,609
Central and North'n Ohio	338,978	370,967	359,420	377,604
Southern Ohio	49,462	48,835	46,973	54,842
Illinois and Indiana	644,039	706,489	703,228	773,150
Mich., Minn., Mo., Wis., Colo. and Utah	148,281	148,837	131,329	147,992
Alabama	228,021	219,015	182,427	205,209
Tennessee	9,356	9,911	9,670	9,921
Total	3,181,411	3,588,118	3,497,564	3,755,680

Daily Rate of Pig Iron Production by Months—Gross Tons

	Steel Works Iron	Merchant Iron*	Total
November, 1928	88,474	21,610	110,084
December	85,415	23,290	108,705
January, 1929	85,530	25,514	111,044
February	89,246	25,261	114,507
March	95,461	24,361	119,822
April	95,680	26,407	122,087
May	100,174	25,571	125,745
June	99,993	23,915	123,908
July	98,044	24,056	122,100
August	98,900	22,251	121,151
September	95,426	21,159	116,585
October	93,644	22,101	115,745
November	83,276	22,771	106,047

*Includes pig iron made for the market by steel companies.

Coke Furnaces in Blast

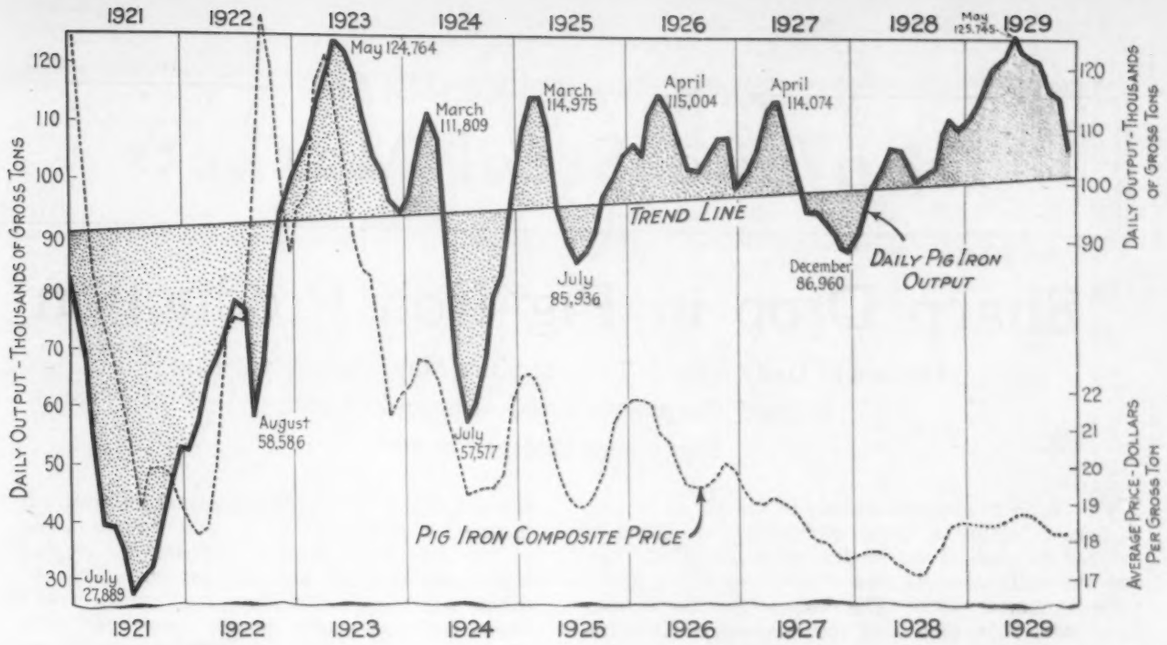
Furnaces	Dec. 1 Number in Blast	Dec. 1 Gross Tons per Day	Nov. 1 Number in Blast	Nov. 1 Gross Tons per Day
New York:				
Buffalo	11	5,540	14	7,085
Other N. Y. and Mass.	3	1,140	3	1,065
New Jersey	0	....	0	....
Pennsylvania:				
Lehigh Valley	5	2,270*	7	2,730*
Schuylkill Valley	5	2,440	5	2,430
Susquehanna Valley	2	1,175	2	1,205
Ferromanganese	0	....	0	....
Lebanon Valley	0	....	0	....
Ferromanganese	0	....	0	....
Pittsburgh District	30	19,300	36	23,600
Ferro. and Spiegel	3	550	3	495
Shenango Valley	3	1,705	5	2,270
Western Pennsylvania	7	3,250	8	4,390
Ferromanganese	2	415	2	400
Maryland	5	3,045	5	2,940
Wheeling District	7	4,220	6	3,520
Ohio:				
Mahoning Valley	13	8,250	18	11,500
Central and Northern	17	10,700	19	12,080
Southern	4	1,650	4	1,570
Illinois and Indiana	29	19,500	33	23,000
Mich., Wis. and Minn.	6	2,865	6	2,915
Colo., Mo. and Utah	4	1,950	4	1,400
Ferromanganese	1	70	1	70
The South:				
Virginia	1	165	1	250
Ferromanganese	1	90	1	95
Kentucky	1	350	2	850
Alabama	16	7,600	16	7,420
Ferromanganese	0	....	0	....
Tennessee	1	210	2	320
Total	177	98,450	203	113,600

*Includes spiegeleisen.

Production of Coke Pig Iron in United States by Months Beginning Jan. 1, 1927—Gross Tons

	1927	1928	1929
Jan.	3,103,820	2,869,761	3,442,370
Feb.	2,940,679	2,900,126	3,206,185
Mar.	3,483,362	3,199,674	3,714,473
Apr.	3,422,226	3,185,504	3,662,625
May	3,390,940	3,283,856	3,898,082
June	3,089,651	3,082,000	3,717,225
½ year	19,430,678	18,520,921	21,640,960
July	2,951,160	3,071,824	3,785,120
Aug.	2,947,276	3,136,570	3,755,680
Sept.	2,774,949	3,062,314	3,497,564
Oct.	2,784,112	3,373,806	3,588,118
Nov.	2,648,376	3,302,523	3,181,411
11 mos.	33,536,551	34,467,958	39,448,853
Dec.	2,695,755	3,369,846	.....
Year*	36,232,306	37,837,804	.....

*These totals do not include charcoal pig iron. The 1928 production of this iron was 142,960 gross tons.



For Eleven Months Production of Pig Iron Has Exceeded the Peak of Five Preceding Years

Inclined line represents the gradually increasing theoretical needs of the country, ascertained by a balancing of the ups and downs in production. It shows an average yearly increase in consumption of about 423,000 tons

203 furnaces blowing on Nov. 1 last.

There were 29 furnaces shut down during November and only three blown in, a net loss of 26. In October the net loss was only two. The loss was confined mainly to steel-making stacks, 24 of the 29 being of that class. There were eight furnaces of the Steel Corporation shut down with 16 belonging to independent steel companies and five merchant stacks. The three furnaces blown in belonged to independent steel companies. The net loss was 21 steel company stacks and five merchant furnaces.

New Record for 11 Months

Even with the large loss in November, a new record for 11 months was made. The total output to Dec. 1 this year has been 39,448,853 tons which is 4,980,895 tons in excess of the same period last year.

Loss in Steel-Making Iron and Ferromanganese

There was a loss of 10,368 tons per day or 11 per cent in the steel-making iron last month. The daily rate was 83,276 tons compared with 93,644 tons in October. Merchant iron made a slight gain.

At 28,285 tons the ferromanganese output was the fifth largest this year and compares with 31,108 tons in October.

Furnaces Blown In and Out

Three furnaces were blown in during November: One furnace of the Wickwire-Spencer Steel Co. in the Buffalo district; one furnace at the Sparrows Point plant of the Bethlehem Steel Corporation in Maryland and No. 2 furnace of the Weirton Steel Co. in the Wheeling district.

Among the furnaces blown out or banked during November were the following: Two furnaces of the Hanna Furnace Co., one furnace of the Wickwire-Spencer Steel Co. and one Lackawanna furnace of the Bethlehem Steel Corporation in the Buffalo district; one furnace of the Bethlehem Steel Co. and one furnace of the New Jersey Zinc Co. in the Lehigh Valley; one Donora furnace of the American Steel & Wire Co., one Carrie furnace of the Carnegie Steel Co., two furnaces of the Jones & Laughlin Steel Corporation, one Midland furnace of the Pittsburgh Crucible Steel Co. and one Monessen furnace of the Pittsburgh Steel Co. in the Pittsburgh district; one furnace at the Cambria plant of the Bethlehem Steel Corporation in western Pennsylvania; one furnace at the Sparrows Point plant of the Bethlehem Steel Corporation in Maryland; the Norton furnace of the American Rolling Mill Co. in Kentucky; two Haselton furnaces of the Republic Iron & Steel Co. and two Campbell and one Hubbard furnaces of the Youngstown Sheet & Tube Co. in the Mahoning Valley; the Sharpsville and one Shenango furnace in the Shenango Valley; one Central furnace of the American Steel & Wire Co. and one River furnace of the Corrigan-McKinney Steel Co. in northern Ohio; one South Chicago furnace of the Illinois Steel Co. and three Gary furnaces in the Chicago district and the Johnson City furnace in Tennessee.

Production of Steel Companies for Own Use—Gross Tons

	Total Pig Iron Spiegel and Ferromanganese			Ferromanganese*		
	1927	1928	1929	1927	1928	1929
Jan.	2,343,881	2,155,133	2,651,416	31,844	22,298	28,208
Feb.	2,256,651	2,274,880	2,498,901	24,560	19,320	25,978
Mar.	2,675,417	2,588,158	2,959,295	27,834	27,912	24,978
Apr.	2,637,919	2,555,500	2,826,028	24,735	18,405	22,413
May	2,619,078	2,652,872	3,105,404	28,734	29,940	25,896
June	2,343,409	2,448,905	2,999,798	29,232	32,088	33,363
½ year	14,876,355	14,675,448	17,040,842	166,939	149,963	160,836
July	2,163,101	2,464,896	3,039,370	26,394	32,909	31,040
Aug.	2,213,815	2,561,904	3,065,874	21,279	24,583	28,461
Sept.	2,090,200	2,477,695	2,862,799	20,675	22,278	27,505
Oct.	2,076,722	2,729,589	2,902,960	17,710	23,939	31,108
Nov.	1,938,043	2,654,211	2,498,291	17,851	29,773	28,285
11 mos.	25,358,236	27,563,743	31,410,136	270,848	283,445	307,235
Dec.	1,987,652	2,647,863	.....	20,992	28,618	.....
Year	27,345,888	30,211,606	.....	291,840	312,063	.....

*Includes output of merchant furnaces.

Iron and Steel Markets

Sharp Drop in Pig Iron Production

Decline in Daily Rate Is Largest Since May, 1925—Recession in Steel Output Arrested—Large Rail and Equipment Orders Placed

PIG IRON production contracted sharply in November, reflecting a rapid adjustment of output to reduced demand. Total production was 3,181,411 tons and the daily average was 106,047 tons, the lowest since September, 1928. The decline from the October daily rate, 9698 tons, was the largest reduction recorded since May, 1925. The net loss in active blast furnaces in November was 26, three having been blown in and 29 put out. The greatest net losses in recent years were 40 furnaces in April, 1924, and 46 in May, 1924.

Both iron and steel makers are avoiding overproduction so far as is possible, although some piling of pig iron and semi-finished steel is reported at Chicago. At the same time unemployment is being kept at a minimum. At Youngstown and at other centers work is being distributed among as large a number of men as possible. Where mills are now running on only one shift, the crews of all three of the customary shifts are being given an equal share of the operating time. Additional employment is being provided by an unusually large amount of repair work, resulting from the heavy strain on equipment in the first nine months of the year.

Steel production as a whole has shown little change, with slight increases tending to offset further reductions. Ingot output at Chicago has declined to 65 per cent, compared with 70 per cent last week, but the rate in the Pittsburgh district continues to range from 65 to 70 per cent. Youngstown production is now estimated at 55 to 60 per cent, compared with 40 to 50 per cent a week ago, while Buffalo operations have dropped from 60 to 50 per cent. The average for Steel Corporation subsidiaries remains at 68 per cent, which also represents the present rate of Bethlehem plants.

Railroad buying is conspicuously good, in contrast with the sharp reduction in the general level of demand. Rail mill backlogs have been augmented by orders for 165,000 tons, and purchases of 6700 freight cars will mean the rolling of 85,000 tons of plates, shapes and bars.

The Southern Pacific has bought 120,000 tons of rails, of which 60,000 tons was placed with the Colorado mill and 30,000 tons each went to the Steel Corporation and the Bethlehem company. The Southern Railway has ordered 44,200 tons of rails from the Alabama subsidiary of the Steel Corporation.

Freight car orders include 5000 bought by the Rock Island, 1000 purchased by the Missouri Pacific and 300 placed by the Milwaukee road. The last named line will buy 3050 additional cars and 30 locomotives, while the Canadian National Railways are inquiring for 3225 cars.

The consistent demand for railroad equipment throughout the fall and the concentration of rail orders, which are ordinarily spread more evenly over the autumn and winter months, have done much to offset the sharp decline in the requirements of the automobile industry and other lines. Shipments of rails from Chicago mills in November were the largest for any month in many years.

Steel specifications from the automotive industry have shown slight improvement and it is now predicted that December production of motor cars will show a gain over the November figure. The change for the better is ascribed to the fact that both the Ford and Chevrolet companies are getting under production in a limited way on their new models. However, recovery of the industry is expected to be slow.

The revival of deferred construction work is the most encouraging market development at Chicago and three projects which came out for figures in that city call for over 29,000 tons of structural steel. Pittsburgh counts on the Washington conferences to result in larger orders, chiefly for structural steel, by February or March. Actual fabricated steel awards for the week, at 12,000 tons, were the lowest of the year, but new work that came into the market totaled 47,000 tons.

The placing of 40,000 tons of plates and shapes for two Leviathan-type vessels for the United States Lines was brought one step nearer by the announcement that the New York Ship Building Corporation submitted the lowest bid.

Tin plate specifications are improving. and the leading producer is running at 80 per cent of capacity, with independents at a 60 per cent rate. Most of the large container manufacturers have placed their contracts for 1930.

Present prices on nearly all of the principal finished steel products have been reaffirmed for first quarter, but consumers are indifferent to their needs for that period and quotations still await a real test.

Scrap markets continue to soften, with heavy melting grade down another 25c. a ton at Pittsburgh.

Pig iron shipments continue to decline, with many foundries now operating on restricted schedules. December specifications from some of the automotive foundries show a gain, but deliveries to other melters tend downward, as the year-end shutdowns for inventories approach. Comparatively little interest has been shown in first quarter requirements.

Ferromanganese has been reduced $5 a ton to $100, seaboard, on contracts for 1930 requirements.

A Comparison of Prices

Market Prices at Date, and One Week, One Month and One Year Previous, Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron, Per Gross Ton:	Dec. 3, 1929	Nov. 26, 1929	Nov. 4, 1929	Dec. 4, 1928
No. 2 fdy., Philadelphia	$21.26	$21.26	$21.26	$21.26
No. 2, Valley furnace	18.50	18.50	18.50	18.00
No. 2 Southern, Cin'ti	17.69	17.69	17.69	20.19
No. 2, Birmingham	14.50	14.50	14.50	16.50
No. 2 foundry, Chicago*	20.00	20.00	20.00	20.00
Basic, del'd eastern Pa	19.75	19.75	19.75	20.25
Basic, Valley furnace	18.50	18.50	18.50	17.50
Valley Bessemer, del'd P'gh	20.76	20.76	20.76	20.01
Malleable, Chicago*	20.00	20.00	20.00	20.00
Malleable, Valley	19.00	19.00	19.00	18.25
Gray forge, Pittsburgh	19.76	19.76	19.76	19.26
L. S. charcoal, Chicago	27.04	27.04	27.04	27.04
Ferromanganese, seaboard	*100.00*	105.00	105.00	105.00
Rails, Billets, Etc., Per Gross Ton:				
Rails, heavy, at mill	$43.00	$43.00	$43.00	$43.00
Light rails at mill	36.00	36.00	36.00	36.00
Rerolling billets, Pittsburgh	35.00	35.00	35.00	33.00
Sheet bars, Pittsburgh	35.00	35.00	35.00	33.00
Slabs, Pittsburgh	35.00	35.00	35.00	33.00
Forging billets, Pittsburgh	40.00	40.00	40.00	38.00
Wire rods, Pittsburgh	40.00	40.00	40.00	42.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb	1.85	1.85	1.85	1.90
Finished Steel,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Bars, Pittsburgh	1.90	1.90	1.90	1.90
Bars, Chicago	2.00	2.00	2.00	2.00
Bars, Cleveland	1.90	1.90	1.90	1.90
Bars, New York	2.24	2.24	2.24	2.24
Tank plates, Pittsburgh	1.90	1.90	1.90	1.90
Tank plates, Chicago	2.00	2.00	2.05	2.00
Tank plates, New York	2.17½	2.17½	2.17½	2.22½
Structural shapes, Pittsburgh	1.90	1.90	1.90	1.90
Structural shapes, Chicago	2.00	2.00	2.00	2.00
Structural shapes, New York	2.09½	2.09½	2.14½	2.19½
Cold-finished bars, Pittsburgh	2.30	2.30	2.30	2.20
Hot-rolled strips, Pittsburgh	1.90	1.90	1.90	1.80
Cold-rolled strips, Pittsburgh	2.75	2.75	2.75	2.85

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Finished Steel,	Dec. 3, 1929	Nov. 26, 1929	Nov. 4, 1929	Dec. 4, 1928
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Sheets, black, No. 24, P'gh	2.75	2.75	2.75	2.75
Sheets, black, No. 24, Chicago dist. mill	2.85	2.85	2.85	2.85
Sheets, galv., No. 24, P'gh	3.40	3.40	3.50	3.50
Sheets, galv., No. 24, Chicago dist. mill	3.50	3.50	3.60	3.60
Sheets, blue, No. 13, P'gh	**2.35**	2.25	2.35	2.10
Sheets, blue, No. 13, Chicago dist. mill	2.45	2.45	2.45	2.20
Wire nails, Pittsburgh	2.40	2.40	2.40	2.55
Wire nails, Chicago dist. mill	2.46	2.45	2.45	2.60
Plain wire, Pittsburgh	2.40	2.40	2.40	2.40
Plain wire, Chicago dist. mill	2.45	2.45	2.40	2.45
Barbed wire, galv., Pittsburgh	3.05	3.05	3.05	3.20
Barbed wire, galv., Chicago dist. mill	3.10	3.10	3.15	3.25
Tin plate, 100 lb. box, P'gh	$5.35	$5.35	$5.35	$5.25
Old Material, Per Gross Ton:				
Heavy melting steel, P'gh	*$15.25*	$15.50	$17.25	$17.00
Heavy melting steel, Phila	14.50	14.50	15.50	15.00
Heavy melting steel, Ch'go	12.50	12.50	13.75	14.50
Carwheels, Chicago	13.50	13.50	14.00	14.25
Carwheels, Philadelphia	15.50	15.50	16.50	16.50
No. 1 cast, Pittsburgh	*14.50*	15.00	15.50	14.50
No. 1 cast, Philadelphia	*15.00*	15.50	16.00	16.25
No. 1 cast, Ch'go (net ton)	13.50	13.50	14.00	15.50
No. 1 RR. wrot., Phila	15.50	15.50	16.00	15.50
No. 1 RR. wrot., Ch'go (net)	12.00	12.00	13.00	13.25
Coke, Connellsville, Per Net Ton at Oven:				
Furnace coke, prompt	$2.65	$2.65	$2.65	$2.75
Foundry coke, prompt	3.75	3.75	3.75	3.75
Metals,				
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Lake copper, New York	18.12½	18.12½	18.12½	16.12½
Electrolytic copper, refinery	17.75	17.75	17.75	15.75
Tin (Straits), New York	*39.37½*	41.62½	40.12½	52.50
Zinc, East St. Louis	*6.00*	6.25	6.50	6.35
Zinc, New York	*6.35*	6.60	6.85	6.70
Lead, St. Louis	6.10	6.10	6.35	6.32½
Lead, New York	6.25	6.25	6.50	6.50
Antimony (Asiatic), N. Y.	8.62½	8.62½	8.62½	10.00

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

Pittsburgh

Steel Trade Sentiment Improved Though Business Is No Better—Depression Expected to Be Short

PITTSBURGH, Dec. 3.—Sentiment is slightly better in the Pittsburgh district this week, although no improvement in business is reported. The steel industry has been quick to react to the Government's program of business relief, and, although the conferences in Washington are not expected to be translated into orders for steel until February or March, there is a growing belief that the present business depression is going to be short-lived. At the same time, few men in the industry look for any sudden return to peak production, but rather a gradual improvement over the first half of the year, which takes into consideration conservative production schedules on the part of the leading automobile manufacturers.

The automotive industry promises to be a slightly larger user of steel this month than it was in November, as model changes are rapidly being completed in the plants of the two principal makers of cars in the low-priced field and both are expected to get into production before the middle of the month. However, a large part of the steel to be required before the end of the year has either been shipped or is now being rolled and the industry must look to other consumers for the maintenance of demand during December.

The railroads, which are expected to contribute a good share of this demand, are not yet specifying freely, nor are the car companies in the Pittsburgh district, which are now well supplied with orders. The local rail mill cannot ordinarily be expected to reach its full stride before January and February, but this company has thus far been able to maintain a 70 to 75 per cent operating rate producing semi-finished steel and structural shapes. Independent companies are not so well engaged, but, because of heavier releases of tin plate, sheets and strip steel, some have improved schedules this week, following sharp curtailment last week after the holiday.

Under the conditions, the average ingot operating rate in this and nearby districts is still at 65 to 70 per cent of capacity, although finishing mill schedules on sheets, strips and bars are not so high.

Present prices on nearly all the principal steel commodities are being reaffirmed for first quarter business. Consumers are still indifferent to their needs for that period and quotations are being tested only by infrequent spot sales. Sheet makers are taking a firmer stand on prices, and shading on blue annealed sheets, which had become common in the last two or three weeks, is less frequently encountered. The same is true on galvanized sheets, although manufacturers as well as jobbers are still getting concessions of $2 a ton from the formal quotation. The heavy hot-rolled products are holding at 1.90c., Pittsburgh, and strip steel is not quotably lower in spite of some pressure on present price.

The pig iron and coke markets are very dull, but weakness in scrap prices is less pronounced than it was two or three weeks ago.

Pig Iron.—The situation shows no change from the previous week, with buying practically negligible and shipments against old contracts at a reduced rate. Consumers are not yet

showing interest in their first quarter requirements, although buyers are occasionally sounding out the price structure. Producers in this and the Valley districts as yet show no inclination to offer lower quotations for first quarter, and in one or two cases the present schedule of $18.50, Valley, for foundry and basic iron, and $19 for malleable and Bessemer has been quoted on advance tonnage. With several furnaces blown out last month, production is fairly well adjusted to consumption and yard stocks are low. This situation is not conducive to price weakness, as pig iron makers are always more willing to shade prices on the product which is already made than they are on future tonnage.

Prices per gross ton, f.o.b. Valley furnace:

Basic	$18.50
Bessemer	19.00
Gray forge	18.00
No. 2 foundry	18.50
No. 3 foundry	18.00
Malleable	19.00
Low phos., copper free	27.00

Freight rate to Pittsburgh or Cleveland district, $1.76.

Prices per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$19.00
No. 2 foundry	19.00
No. 3 foundry	18.50
Malleable	19.50

Freight rates to points in Pittsburgh district range from 63c. to $1.13.

Semi-Finished Steel.—Shipments to non-integrated companies are still declining as most of these users of semi-finished steel are anxious to reduce their stocks as low as possible for year-end inventories. However, a few companies have already made such reductions and are now forced to take regular shipments of small tonnages as their finishing mill needs require. The price of billets, slabs and sheet bars is unsettled and is still quoted nominally at $35, Pittsburgh or Youngstown. Some tonnage is undoubtedly moving at this figure, but it is not likely that any first quarter contracts have been taken at this price. By the latter half of the month the price will undoubtedly be established by open market transactions. Forging billets are unchanged at $40, Pittsburgh, and this quotation is still holding on small spot tonnages. Wire rods are also quoted at $40, Pittsburgh or Cleveland, and makers have opened their books for first quarter at this figure. Demand for skelp is declining, as pipe operations are lighter.

Bars, Shapes and Plates.—The heavy hot-rolled products are finding a fair demand in the aggregate, with bars exceedingly dull, plates only fair, and structural shapes comparatively good. The outlook for structural business is especially favorable, as steel fabricators expect to benefit as much or more than any other large steel consumers in the Government's program for stimulating business. In the immediate Pittsburgh district an addition to the Bell Telephone Building, recently placed, takes 3300 tons of steel, and there is still prospect for the letting before the end of the year of a bridge across the Ohio River at McKees Rocks, which will require about 13,000 tons of shapes. Several other sizable jobs are in the formative state, and, although some of this work may be delayed until early spring, it will undoubtedly go ahead at that time. This work will also stimulate the reinforcing bar industry, which is now seasonably quiet, and a contributing factor in the dullness of the steel bar business as a whole. Mills in this district are not yet receiving very heavy releases on plates from the nearby car shops, but the car builders have considerable business on their books, and expect to receive more before the end of the year. Some of the barge yards are rather badly in need of business and are now completing most of the barges placed in the summer and fall. Bids will soon be taken by the United States Engineer at Rock Island, Ill., for 20 steel barges requiring about 1300 tons of plates. Some makers of bars, shapes and plates expect to open their books for first quarter this week, reaffirming the present quotation of 1.90c., Pittsburgh, which has been subject to no real test in the last few weeks. As yet buyers are showing little interest in their requirements for the early months of 1930.

Rails and Track Accessories.—Pittsburgh mills have not benefited very largely from recent rail orders, but are now increasing their operations and will soon be making heavy shipments against tonnage placed earlier in the fall. Specifications for track accessories are only fair, but are showing some improvement. Demand for light rails is better than usual for this time of the year, but the aggregate tonnage of this product is not sizable. Prices on track equipment are nominal.

Wire Products.—The wire business is holding at about the same rate as the majority of other steel products. Demand for nails seems to be somewhat better than it was earlier in the year. Jobbers have very low stocks of nails and wire, and are taking carload shipments regularly for immediate delivery. Some makers have closed first quarter contracts with most of their important users at $2.40 to $2.50, Pittsburgh, on nails, 2.40c. on manufacturers' wire, and 2.55c. to 2.65c. on annealed wire. Manufacturers' wire has naturally felt the decline in automotive consumption, but is going into other lines at a fair rate.

Tubular Goods.—Pipe business is not particularly good, but has not felt the sharp decline which has characterized some other steel lines. In fact, demand for merchant pipe, which has been only fair this year, held up much later in the season than usual, and the aggregate tonnage shipped will not fall far under the preceding year. Lap-welded tubing is also feeling the usual seasonal decline, as the period for laying this pipe is limited in many parts of the country, and Pittsburgh mills have now completed shipments against many jobs which served as backlogs during the summer and fall. Seamless tubing is in fair demand, while the mechanical product is very dull. The automobile industry, normally a large user of this product, is taking little or none at this time and airplane makers reduced their requirements sharply several weeks ago. Boiler tubes are moving well.

Sheets.—Specifications for sheet steel still seem to be on the decline, although some companies are rolling some material for stock and are maintaining a fair operating rate. The leading interest last week operated its mills at about 60 per cent of theoretical capacity, but this rate was hardly equalled by the independents, particularly those whose product is

The Iron Age Composite Prices

Finished Steel

Dec. 3, 1929, 2.362c. a Lb.

One week ago	2.362c.
One month ago	2.362c.
One year ago	2.362c.
10-year pre-war average	1.689c.

Based on steel bars, beams, tank plates, wire, rails, black pipe and black sheets. These products make 87 per cent of the United States output of finished steel.

	High	Low
1929	2.412c., April 2;	2.362c., Oct. 29
1928	2.391c., Dec. 11;	2.314c., Jan. 3
1927	2.453c., Jan. 4;	2.293c., Oct. 25
1926	2.453c., Jan. 5;	2.403c., May 18
1925	2.560c., Jan. 6;	2.396c., Aug. 18

Pig Iron

Dec. 3, 1929, $18.29 a Gross Ton

One week ago	$18.29
One month ago	18.38
One year ago	18.59
10-year pre-war average	15.72

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1929	$18.71, May 14;	$18.25, Aug. 27
1928	18.59, Nov. 27;	17.04, July 24
1927	19.71, Jan. 4;	17.54, Nov. 1
1926	21.54, Jan. 5;	19.46, July 13
1925	22.50, Jan. 13;	18.96, July 7

Mill Prices of Finished Iron and Steel Products

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c.
F.o.b. Chicago	2.00c.
Del'd Philadelphia	2.22c.
Del'd New York	2.24c.
Del'd Cleveland	1.85c. to 1.90c.
F.o.b. Cleveland	1.85c. to 1.90c.
F.o.b. Lackawanna	2.00c.
F.o.b. Birmingham	2.10c.
C.i.f. Pacific ports	2.35c.
F.o.b. San Francisco mills	2.35c.

Billet Steel Reinforcing

F.o.b. Pittsburgh mills, 40, 50, 60-ft.	2.00c.
F.o.b. Pittsburgh mills, cut lengths	2.25c.
F.o.b. Birmingham, mill lengths	2.10c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.90c.
F.o.b. Chicago Heights mill	1.90c.
Del'd Philadelphia	2.27c.

Iron

Common iron, f.o.b. Chicago	2.00c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.12c.
Common iron, del'd New York	2.14c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c.
F.o.b. Chicago	2.00c.
F.o.b. Birmingham	2.05c.
Del'd Cleveland	2.09c. to 2.14c.
Del'd Philadelphia	2.10c. to 2.15c.
F.o.b. Coatesville	2.00c. to 2.05c.
F.o.b. Sparrows Point	2.00c. to 2.05c.
F.o.b. Lackawanna	2.00c. to 2.05c.
Del'd New York	2.17½c. to 2.22½c.
C.i.f. Pacific ports	2.25c. to 2.35c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.90c.
F.o.b. Chicago	2.00c.
F.o.b. Birmingham	2.05c.
F.o.b. Lackawanna	2.00c. to 2.05c.
F.o.b. Bethlehem	2.00c.
Del'd Cleveland	2.09c. to 2.14c.
Del'd Philadelphia	1.96c. to 2.06c.
Del'd New York	2.09½c. to 2.14½c.
C.i.f. Pacific ports	2.35c.

Hot-Rolled Hoops, Bands and Strips

	Base per Lb.
6 in. and narrower, P'gh	2.00c.
Wider than 6 in., P'gh	1.90c.
6 in. and narrower, Chicago	2.10c.
Wider than 6 in., Chicago	2.00c.
Cooperage stock, P'gh	2.20c.
Cooperage stock, Chicago	2.30c.

Cold-Finished Steel

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	2.20c.
Bars, f.o.b. Chicago	2.20c.
Bars, Cleveland	2.20c.
Bars, Buffalo	2.20c.
Shafting, ground, f.o.b. mill	*2.55c. to 3.50c.
Strips, P'gh	2.75c.
Strips, Cleveland	2.75c.
Strips, del'd Chicago	3.05c.
Strips, Worcester	2.90c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	4.25c.

*According to size.

Wire Products

(Carload lots, f.o.b. Pittsburgh and Cleveland.)

To Merchant Trade

	Base per Keg
Standard wire nails	$2.40 to $2.50
Cement coated nails	2.40 to 2.50
Galvanized nails	4.40 to 4.50

	Base per Lb.
Polished staples	2.85c. to 2.95c.
Galvanized staples	3.10c. to 3.20c.
Barbed wire, galvanized	3.05c. to 3.15c.
Annealed fence wire	2.55c. to 2.65c.
Galvanized wire, No. 9	3.00c. to 3.10c.
Woven wire fence (per net ton to retailers)	$65.00

To Manufacturing Trade

Bright hard wire, Nos. 6 to 9 gage	2.40c.
Spring wire	3.50c.

(Carload lots, f.o.b. Chicago.)

Wire nails	$2.45 to $2.55 (keg)
Annealed fence wire	2.60c. to 2.70c. (lb.)
Bright hard wire to manufacturing trade	2.45c.

Anderson, Ind., mill prices are ordinarily $1 a ton over Pittsburgh base; Duluth, Minn., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

Cut Nails

	Per 100 Lb.
Carloads, Wheeling, Reading or Northumberland, Pa.	$2.70
Less carloads, Wheeling or Reading	2.80

Light Plates

No. 10, blue annealed, f.o.b. P'gh	2.20c.
No. 10, blue annealed, f.o.b. Chicago dist.	2.30c.
No. 10, blue annealed, del'd Phila.	2.42c. to 2.52c.
No. 10, blue annealed, B'ham	2.35c.

Sheets

Blue Annealed

	Base per Lb.
No. 13, f.o.b. P'gh	2.35c.
No. 13, f.o.b. Chicago dist.	2.45c.
No. 13, del'd Philadelphia	2.57c. to 2.67c.
No. 13, blue annealed, B'ham	2.50c.

Box Annealed, One Pass Cold Rolled

No. 24, f.o.b. Pittsburgh	2.75c.
No. 24, f.o.b. Chicago dist. mill	2.85c.
No. 24, del'd Philadelphia	3.07c.
No. 24, f.o.b. Birmingham	3.00c. to 3.10c.

Metal Furniture Sheets

No. 24, f.o.b. P'gh	4.00c. to 4.10c.

Galvanized

No. 24, f.o.b. Pittsburgh	3.40c. to 3.50c.
No. 24, f.o.b. Chicago dist. mill	3.50c. to 3.60c.
No. 24, del'd Cleveland	3.59c. to 3.69c.
No. 24, del'd Philadelphia	3.72c. to 3.82c.
No. 24, f.o.b. Birmingham	3.65c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.90c. to 3.00c.
No. 28, f.o.b. Chicago dist. mill	3.00c. to 3.10c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	4.00c.

Long Ternes

No. 24, 8-lb. coating, f.o.b. mill	3.90c. to 4.00c.

Vitreous Enameling Stock

No. 24, f.o.b. Pittsburgh	3.90c.

Tin Plate

	Per Base Box
Standard cokes, f.o.b. P'gh district mills	$5.35
Standard cokes, f.o.b. Gary	5.45

Terne Plate

(*F.o.b. Morgantown or Pittsburgh*)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$10.70
15-lb. coating I.C.	13.40
20-lb. coating I.C.	14.60
25-lb. coating I.C.	$15.90
30-lb. coating I.C.	16.80
40-lb. coating I.C.	18.80

Alloy Steel Bars

(F.o.b. makers' mill)
Alloy Quality Bar Base, 2.65c. per Lb.

S.A.E. Series Numbers		Alloy Differential
2000	(1½% Nickel)	$0.25
2100	(1½% Nickel)	0.55
2300	(3½% Nickel)	1.50
2500	(5% Nickel)	2.25
3100	Nickel Chromium	0.55
3200	Nickel Chromium	1.35
3300	Nickel Chromium	3.80
3400	Nickel Chromium	3.20
4100	Chromium Molybdenum (0.15 to 0.25 Molybdenum)	0.50
4100	Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600	Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.25 to 1.75 Nickel)	1.05
5100	Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100	Chromium Steel (0.80 to 1.10 Chromium)	0.45
5100	Chromium Spring Steel	0.20
6100	Chromium Vanadium Bars	1.20
6100	Chromium Vanadium Spring Steel	0.95
9250	Silicon Manganese Spring Steel (flats)	0.25
	Rounds and squares	0.50
	Chromium Nickel Vanadium	1.50
	Carbon Vanadium	0.95

Above prices are for hot rolled steel bars, forging quality. The differential for cold-drawn bars is ¾c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a sectional area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	36.00
Light (from rail steel), f.o.b. mill	34.00
Light (from billets), f.o.b. Ch'go mill	36.00

Track Equipment

	Base per 100 Lb.
Spikes, ⅞ in. and larger	$2.80
Spikes, ½ in. and smaller	2.80
Spikes, boat and barge	3.00
Tie plate, steel	2.15
Angle bars	$2.75
Track bolts, to steam railroads	$3.80 to 4.60
Track bolts, to jobbers, all sizes, per 100 count	70 per cent off list

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
⅛	45	19½	¼ and ⅜	+11	+36
¼ to ⅜	51	25½	½	23	5
½	56	42½	¾	28	11
¾	60	48½	1 and 1¼	31	15
1 to 3	62	50½	1½ and 2	35	18

Lap Weld

2	55	43½	2	23	9
2½ to 6	59	47½	2½ to 3½	28	13
7 and 8	56	43½	4 to 6	30	17
9 and 10	54	42½	7 and 8	29	16
11 and 12	53	40½	9 to 12	26	11

Butt Weld, extra strong, plain ends

⅛	41	24½	¼ and ⅜	+13	+48
¼ to ⅜	47	30½	½	23	7
½	53	42½	¾	28	12
¾	58	47½	1 to 2	34	18
1 to 1½	60	49½			
2 to 3	61	50½			

Lap Weld, extra strong, plain ends

2	53	42½	½	29	13
2½ to 4	57	46½	2½ to 4	34	20
4½ to 6	56	45½	4½ to 6	33	19
7 to 8	52	39½	7 and 8	31	17
9 and 10	45	32½	9 to 12	21	8
11 and 12	44	31½			

On carloads the above discounts on steel pipe are increased on black by one point, with supplementary discount of 5%, and on galvanized by 1½ points, with supplementary discount of 5%. On iron pipe, both black and galvanized, the above discounts are increased to jobbers by one point with supplementary discounts of 5 and 2½%.

Note.—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¼ in.	13
3¼ in.—3¾ in.	54	2½ in.—2¾ in.	16
4 in.	57	3 in.	17
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3½ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3½ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the above base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points, with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. and lighter than standard gage take the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30%, base (carloads)	55
Carbon, 0.30% to 0.40% base	50

Plus differentials for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

largely full-finished. The automobile industry fails to show any encouraging trends, although the largest maker of cars in the low-priced class expects to get into production by the middle of the month on its new model and will gradually step up production in January. Makers of high-priced cars which were running at a good rate a month ago have now curtailed sharply, and the average output of companies in both the high and medium-price range is well under 50 per cent. Sheet makers have opened their books for first quarter in a quiet way, and are beginning to solicit business for that period. On some finishes a firmer price stand is being taken. Because of the competition of mills rolling sheets by the continuous process, the matter of quoting market prices on blue annealed sheets recently has become complicated. The quotations appearing in THE IRON AGE relate to the jobbing mill product of quality grade. Leading producers of standard blue annealed sheets have reaffirmed their stand for a minimum of 2.35c. a lb., Pittsburgh, for No. 13 gage and 2.20c. a lb. for No. 10 gage, with usual extras. The continuous mill product, which is often sold on a hot-rolled strip steel base, has been quoted at prices from $2 to $4 a ton below these figures. The continuous mill product is made in a limited range of widths and is sold either annealed or unannealed. Quotations shown in THE IRON AGE for blue annealed sheets relate to the standard product. Black sheets are still holding at 2.75c., Pittsburgh, and galvanized at 3.40c. to 3.50c. With some companies the former price applies only to large jobbers, while others are offering it to the manufacturing trade. The 4c., Pittsburgh, price on automobile body sheets is still subject to pressure in the Detroit area, but has not yet been openly broken. Metal furniture sheets are at 4c. to 4.10c.

Warehouse prices, f.o.b. Pittsburgh

	Base per Lb.
Plates	3.00c.
Structural shapes	3.00c.
Soft steel bars and small shapes	2.90c.
Reinforcing steel bars	2.75c.
Cold-finished and screw stock—	
Rounds and hexagons	3.60c.
Squares and flats	4.10c.
Bands	3.25c.
Hoops	4.25c.
Black sheets (No. 24), 25 or more bundles	3.70c. to 3.80c.
Galv. sheets (No. 24), 25 or more bundles	4.35c. to 4.45c.
Light plates, blue annealed (No. 10), 1 to 24 plates	3.25c. to 3.35c.
Blue annealed sheets (No. 13), 1 to 24 sheets	3.40c. to 3.50c.
Galv. corrug. sheets (No. 28), per square	$4.33
Spikes, large	3.40c.
Small	3.80c. to 5.25c.
Boat	3.80c.
Track bolts, all sizes, per 100 count,	60 per cent off list
Machine bolts, 100 count,	60 per cent off list
Carriage bolts, 100 count,	60 per cent off list
Nuts, all styles, 100 count,	60 per cent off list
Large rivets, base per 100 lb.	$3.50
Wire, black soft ann'l'd, base per 100 lb.	$2.90 to 3.00
Wire, galv. soft, base per 100 lb.	2.90 to 3.00
Common wire nails, per keg	2.80 to 2.90
Cement coated nails, per keg	2.95 to 3.05

Tin Plate.—The industry as a whole has not yet increased its operations to any large extent, but specifications are beginning to improve and the leading interest has scheduled its mills this week at close to 80 per cent. Independents are running at about 60 per cent, but in some cases tonnage releases warrant a slightly better rate. Most of the large container manufacturers have placed their contracts for 1930, but a few are still hesitating with some hope of bringing out better prices.

Strip Steel.—Strip business shows little improvement, and the industry as a whole is not averaging better than 30 to 40 per cent of capacity. Some weeks these figures might be lower, but mills which curtail output to a minimum one week can usually expect a considerably better showing in the next comparable period. Last week many of them observed the Thanksgiving holiday and did not resume operations on Friday. The hot mills are better occupied than the cold mills, but this condition is to be expected. Prices are still untested by any significant tonnage buying, but some contracts for first quarter have been taken at 2.75c., Pittsburgh or Cleveland, for cold-rolled strip and 1.90c. and 2c., Pittsburgh, for hot-rolled.

Coal and Coke.—The coke market is in an unsatisfactory state, as production is declining less rapidly than consumption, and distress tonnage is a disturbing market factor. The furnace grade is quotable at $2.65 a net ton, Connellsville, while foundry coke is selling more freely at as low as $3.50. The premium brands are holding at $4.75 to $4.85, ovens. Colder weather during the last week has developed a considerably better demand for heating coke. Coal is also in stronger demand, but domestic consumption cannot offset the sharp decline in industrial demand.

Old Material.—The scrap market apparently has not reached bottom, but price weakness is not so pronounced this week as it has been in the last two. The Baltimore & Ohio Railroad list, which closed yesterday, is understood to have brought $15.50, or slightly better, for the No. 1 heavy melting steel, but this figure undoubtedly represents the top of the market. Dealers are beginning to accumulate yard stocks, for which some of them are paying as high as $15 for strictly No. 1 steel. Lower prices are heard in some instances, but the market is scarcely quotable at lower than $15 to $15.50, a decline of 25c. from last week in the average price. Sale of a tonnage of hydraulic compressed sheets last week by a local producer brought only $14.50, and this marks a sharp decline in the quotations on that commodity. Specialties are still strong, and some dealers are meeting with difficulty in picking up tonnage to cover old contracts. The other grades of scrap are weak and quotations are nominal. The Pennsylvania Railroad list, which closes on Dec. 4, contains 36,700 tons, including 3300 tons of No. 1 heavy melting.

Prices per gross ton delivered consumers' yards in Pittsburgh and points taking the Pittsburgh district freight rate:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$15.00 to $15.50
No. 2 heavy melting steel	13.00 to 13.50
Scrap rails	14.00 to 14.50
Compressed sheet steel	14.50 to 15.00
Bundled sheets, sides and ends	14.00 to 14.50
Cast iron carwheels	14.00 to 14.50
Sheet bar crops, ordinary	17.00 to 17.50
Heavy breakable cast	11.00 to 11.50
No. 2 railroad wrought	15.00 to 15.50
Hvy. steel axle turnings	15.00 to 15.50
Machine shop turnings	10.00 to 10.50
Acid Open-Hearth Grades:	
Railr. knuckles and couplers	19.50 to 20.50
Railr. coil and leaf springs	19.50 to 20.50
Rolled steel wheels	19.50 to 20.50
Low phos. billet and bloom ends	20.50 to 21.00
Low phos., mill plates	20.50 to 21.00
Low phos., light grades	19.50 to 20.50
Low phos., sheet bar crops	20.50 to 21.00
Heavy steel axle turnings	15.00 to 15.50
Electric Furnace Grades:	
Low phos., punchings	18.50 to 19.00
Hvy. steel axle turnings	15.00 to 15.50
Blast Furnace Grades:	
Short shoveling steel turnings	10.50 to 11.00
Short mixed borings and turnings	10.50 to 11.00
Cast iron borings	10.50 to 11.00
Rolling Mill Grades:	
Steel car axles	19.50 to 20.50
Cupola Grades:	
No. 1 cast	14.00 to 15.00
Rails 3 ft. and under	17.50 to 18.50

Belfont Steel & Wire Co. in Receivership

David T. Croxton, vice-president, Cleveland-Cliffs Iron Co., Cleveland, and I. P. Blanton, president, Belfont Steel & Wire Co., were appointed receivers for the Belfont company on Nov. 25 by Judge Robert Nevin, of the United States District Court, Cincinnati. The appointments were made following the filing of a petition for a receiver by Hickman, Williams & Co., dealers in pig iron, scrap, coke and alloys.

The complainant alleged that it is a creditor on a promissory note for $2,000 and on an open account for $1,000. The court was advised that the company also owes $87,197 on promissory notes given to creditors, $377,761 on open accounts and $79,509 as Federal taxes.

It also was said that the Norfolk & Western Railway Co. had brought suit in Federal Court on a note for $5,000 and that similar actions are threatened by other creditors. The complainant further alleged that the company's difficulties are the result of the absence of liquid assets and asserted the belief that the company will be able to meet all indebtedness if permitted to operate its business without interruption.

The Belfont Steel & Wire Co. is one of the oldest steel concerns in Ohio. It was established in 1864 under the name Belfont Steel Co. In 1923, the company was merged with the Kelly Nail & Iron Co., Ironton, and the name was changed to the Belfont Steel & Wire Co.

Semi-Finished Steel, Raw Materials, Bolts and Rivets

Mill Prices of Semi-Finished Steel

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$35.00
Rerolling, 4-in. and under 10-in., Youngstown	35.00
Rerolling, 4-in. and under 10-in., Cleveland	35.00
Rerolling, 4-in. and under 10-in., Chicago	36.00
Forging quality, Pittsburgh	40.00

Sheet Bars

(Open Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$35.00
Youngstown	35.00
Cleveland	35.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$35.00
Youngstown	35.00
Cleveland	35.00

Skelp

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.85c. to 1.90c.
Universal	1.85c. to 1.90c.
Sheared	1.85c. to 1.90c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$40.00
Cleveland	40.00
Chicago	41.00

Prices of Raw Material

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron ore, low phos., copper free, 55 to 58% iron in dry Spanish or Algerian	12.00c.
Iron ore, low phos., Swedish, average 68% iron	12.00c.
Iron ore, basic Swedish, average 65% iron	10.00c.
Manganese ore, washed, 52% manganese, from the Caucasus	30.00c.
Manganese ore, Brazilian, African or Indian, basic 50%	30.00c.
Tungsten ore, high grade, per unit, in 60% concentrates	$15.50 to $16.50
	Per Gross Ton
Chrome ore, 45 to 50% Cr_2O_3, crude, c.i.f. Atlantic seaboard	$22.00 to $24.00
	Per Lb.
Molybdenum ore, 85% concentrates of MoS_2, delivered	50c. to 55c.

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville prompt	$2.65
Foundry, f.o.b. Connellsville prompt	$3.75 to 4.75
Foundry, by-product, Ch'go ovens	8.00
Foundry, by-product, New England, del'd	11.00
Foundry, by-product, Newark or Jersey City, delivered	9.00 to 9.40
Foundry, by-product, Phila.	9.00
Foundry, Birmingham	5.00
Foundry, by-product, St. Louis, f.o.b. ovens	8.00
Foundry by-prod., del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.25 to $1.75
Mine run coking coal, f.o.b. W. Pa. mines	1.50 to 1.75
Gas coal, ¾-in. f.o.b. Pa. mines	1.90 to 2.00
Mine run gas coal, f.o.b. Pa. mines	1.65 to 1.75
Steam slack, f.o.b. W. Pa. mines	80c. to 90c.
Gas slack, f.o.b. W. Pa. mines	1.00 to 1.10

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$105.00
Foreign, 80%, Atlantic or Gulf port, duty paid	105.00

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$31.00 to $34.00
Domestic, 16 to 19%	29.00 to 32.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50%	$83.50
75%	130.00

	Per Gross Ton Furnace		Per Gross Ton Furnace
10%	$35.00	12%	$39.00
11%	37.00	14 to 16%	45.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
10%	$30.00	12%	$34.00
11%	32.00		

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

	Per Gross Ton		Per Gross Ton
6%	$22.00 to $23.00	10%	$26.00 to $28.00
7%	23.00 to 24.00	11%	28.00 to 30.00
8%	24.00 to 25.00	12%	30.00 to 32.00
9%	25.00 to 26.00		

Other Ferroalloys

Ferrotungsten, per lb. contained metal del'd	$1.40 to $1.50
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr. delivered, in carloads	11.00c.
Ferrovanadium, per lb. contained vanadium, f.o.b. furnace	$3.15 to $3.65
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace, in carloads	$160.00
Ferrophosphorus, electric or blast furnace material, in carloads, 18%, Rockdale, Tenn., base, per gross ton	$91.00
Ferrophosphorus, electric 24%, f.o.b. Anniston, Ala., per gross ton	$122.50

Fluxes and Refractories

Fluorspar

	Per Net Ton
Domestic, 85% and over calcium fluoride, not over 5% silicon, gravel, f.o.b. Illinois and Kentucky mines	$18.00
No. 2 lump, Illinois and Kentucky mines	20.00
Foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Atlantic port, duty paid	$18.25 to 18.75
Domestic, No. 1 ground bulk, 95 to 98% calcium fluoride, not over 2½% silica, f.o.b. Illinois and Kentucky mines	32.50

Fire Clay Brick

	Per 1000 f.o.b. Works	
	High-Heat Duty Brick	Intermediate Heavy Duty Brick
Pennsylvania	$43.00 to $46.00	$35.00 to $38.00
Maryland	43.00 to 46.00	35.00 to 38.00
New Jersey	50.00 to 65.00	.....
Ohio	43.00 to 46.00	35.00 to 38.00
Kentucky	43.00 to 46.00	35.00 to 38.00
Missouri	43.00 to 46.00	35.00 to 38.00
Illinois	43.00 to 46.00	35.00 to 38.00
Ground fire clay, per ton	7.00	

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$43.00
Chicago	52.00
Birmingham	50.00
Silica clay, per ton	$8.50 to 10.00

Magnesite Brick

	Per Net Ton
Standard sizes, f.o.b. Baltimore and Chester, Pa.	$65.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	40.00
Standard size	45.00

Chrome Brick

	Per Net Ton
Standard size	$45.00

Mill Prices of Bolts, Nuts, Rivets and Set Screws

Bolts and Nuts

Per 100 Pieces

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
†Machine bolts	70
†Carriage bolts	70
Lag bolts	70
Plow bolts, Nos. 1, 2, 3 and 7 heads	70
Hot-pressed nuts, blank or tapped, square	70
Hot-pressed nuts, blank or tapped, hexagons	70
C.p.c. and t. square or hex. nuts, blank or tapped	70
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.

†Bolts with rolled thread up to and including ⅛ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	70
Semi-finished hexagon castellated nuts, S.A.E.	70
Stove bolts in packages, P'gh	75, 20, 10 and 5
Stove bolts in packages, Chicago	75, 20, 10 and 5
Stove bolts in packages, Cleveland	75, 20, 10 and 5
Stove bolts in bulk, P'gh	75, 20, 10, 5 and 2½
Stove bolts in bulk, Chicago	75, 20, 10, 5 and 2½
Stove bolts in bulk, Cleveland	75, 20, 10, 5 and 2½
Tire bolts	60, 5 and 5

Discounts of 70 per cent off on bolts and nuts applied on carload business. For less than carload orders discounts of 55, 60 per cent apply.

Large Rivets

(½-in. and larger)

	Base per 100 Lb.
F.o.b. Pittsburgh or Cleveland	$3.10
F.o.b. Chicago	3.20

Small Rivets

(⅞-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70 and 10
F.o.b. Cleveland	70 and 10
F.o.b. Chicago	70 and 10

Cap and Set Screws

(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws	80, 10 and 5
Milled standard set screws, case hardened,	80 and 5
Milled headless set screws, cut thread	75 and 10
Upset hex. head cap screws, U.S.S. thread	85
Upset hex. cap screws, S.A.E. thread	85
Upset set screws	80, 10 and 5
Milled studs	70

Chicago

Steel Output Recedes to 65 Per Cent Rate—Railroad Equipment Outstanding in Otherwise Slack Market

CHICAGO, Dec. 3.—The Chicago steel market is experiencing a gradual but definite slackening in demands. This change in the attitude of consumers is not restricted to any one line of steel mill products nor is there indication that any particular group of manufacturers is more affected than others. The recession in shipments is orderly and in a great measure reflects the approach of the inventory period and expected holiday shutdowns more than it does sharp curtailment of buying on the part of ultimate consumers of commodities into which iron and steel enter.

New orders for cars for the Rock Island and the Missouri Pacific will take over 80,000 tons of steel and new inquiries for cars for the Milwaukee road call for 45,000 tons of steel. Included in this week's railroad business is 44,200 tons of rails ordered by the Southern Railway from the Tennessee Coal, Iron & Railroad Co.

The outlook for new building work in Chicago still holds much promise. Although actual inquiries have not been made for some of the larger projects, the trade seems reasonably certain that figures will soon be taken for a large tonnage of structural shapes. Fresh projects made public this week will require an estimated 30,000 tons.

Prices for finished steel are holding, but it is expected that real tests of the situation will be afforded in the next three to four weeks. Books have been opened for first quarter by sheet and wire producers.

Output of steel ingots in this district has receded to 65 per cent of capacity. Some producers are attempting to match output with shipments, but at other steel mills both pig iron and semi-finished steel are accumulating. No. 1 furnace at Gary has been banked. The leading producer is now blowing 13 of 27 stacks, and, for the district as a whole, 22 of 36 furnaces are in blast.

Pig Iron.—Shipments of Northern pig iron are at a lower rate as the holiday and inventory periods draw nearer. While there is this noticeable decrease in total specifications, there is at the same time an increase in demand from malleable foundries, which are finding business more active in the railroad equipment and automobile fields. Sellers are willing to take first quarter business at present prices, but interest in future needs is spotty and variable. Small purchases for immediate needs are in good volume. All merchant stacks in this district are lighted and, in view of the tapering in shipments, stocks at furnaces are growing. The Southern iron market is quiet.

Prices per gross ton at Chicago:

N'th'n No. 2 fdy., sil. 1.75 to 2.25	$20.00
N'th'n No. 1 fdy., sil. 2.25 to 2.75	20.50
Malleable, not over 2.25 sil.	20.00
High phosphorus	20.00
Lake Super. charcoal, sil. 1.50	27.04
So'th'n No. 2 fdy. (all rail)	$19.01 to 19.51
Low phos., sil. 1 to 2, copper free	29.50
Silvery, sil. 8 per cent	$28.79 to 29.79
Bess. ferrosilicon, 14-15 per cent	46.29

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnace, not including an average switching charge of 61c. per gross ton.

Rails and Track Supplies.—The inquiry by the Missouri-Kansas-Texas for 7500 tons of standard-section rails is still open, according to reports here. Chicago district rail mills are holding to the high rate of production reached in late November. Shipments of rails in the past 30 days were the heaviest for one month in many years. Miscellaneous orders for track supplies total 6000 tons, and inquiries, including 14,000 tons asked for a week ago by the New York Central, aggregate 25,000 tons.

Prices f.o.b. mill, per gross ton: Standard section open-hearth and Bess. rails, $43; light rails, rolled from billets, $36. *Per lb.:* Standard railroad spikes, 2.80c.; track bolts with square nuts, 3.80c.; steel tie plates, 2.07½c. to 2.15c.; angle bars, 2.75c.

Sheets.—Local producers are opening first quarter books. Several sizable orders for delivery in the next year have already been entered, and sellers find many buyers in a mood to consider future needs. This situation is in contrast with the character of purchases for the quarter now ending. As the third period of this year neared an end, users held out of the market except for immediate needs and they continued to practise hand-to-mouth buying, with the result that mill books in the last two and one-half months have not showed backlogs of satisfactory size. The effect of placing orders in this way is that stocks in the hands of consumers are at an unusually low point, and on this score sheet producers expect to get a quick response in the way of releases with the first impulse of improvement in the general business situation. Prices asked are 2.90c. a lb., delivered Chicago, for black sheets, 3.55c. to 3.60c. for galvanized sheets, and 2.35c. for No. 10 gage blue annealed. Output of local mills is close to 50 per cent of hot mill capacity, which is about the rate at which releases are going to mills. Rolling schedules are at short range, though this situation is somewhat better, as shown by the fact that the Milwaukee hot mills, which have been down for about 10 days, resumed operations on Tuesday of this week. Distribution of sheets by jobbers is less active, as gaged by specifications to mills, though this is not a wholly satisfactory indicator, as at this time of the year jobbers are looking toward reduction of inventories.

Base prices per lb., deliv'd from mill in Chicago: No. 24 black sheets, 2.90c.; No. 24 galv., 3.55c. to 3.65c.; No. 10 blue ann'l'd, 2.35c. Deliv'd prices at other Western points are equal to the freight from Gary, plus the mill prices, which are 5c. per 100 lb. lower than Chicago delivered prices.

Cast Iron Pipe.—Early winter weather in the Middle West has served to cut off small orders, which in recent weeks have been moderately active. Fresh inquiry in and near Chicago is practically at a standstill and sellers can see little in the remainder of this month unless public utilities, which it is understood have new programs that are larger by about 6 per cent than those prepared for 1929, begin to inquire before the opening of the new year. Avon, Ohio, is said to have placed 11,000 ft. of 6-in. pipe with an unnamed bidder. A new project for a sailors' and soldiers' home at Xenia, Ohio, calls for 8000 ft. of 3 to 6-in. pipe. Bids will be opened Dec. 14. There is still doubt whether winter buying prices will be named and, in the meantime, current quotations are unchanged in a very dull market. The early cold snap is resulting in hurried calls for prompt shipment of old orders, and such new business as is before the trade is being placed largely where most favorable deliveries can be promised.

Prices per net ton, deliv'd Chicago: Water pipe, 6-in. and over, $43.70 to $45.70; 4-in., $47.70 to $49.70; Class A and gas pipe, $3 extra.

Structural Material.—Recent developments in the Chicago building market lend added support to the belief among fabricators that the present dullness in business is not to last long. It is reported here that the Northwestern Mutual Life Building, Milwaukee, requiring 3000 tons, will soon be out for bids. Prices are to be asked this week on 5000 tons for a traction company bridge at Indianapolis. New projects in Chicago are the Wabash Avenue bridge, which will take 2500 tons; the Chicago Yacht Club, which calls for 1800 tons, and, for the near future, according to re-

Warehouse Prices, f.o.b. Chicago

	Base per Lb.
Plates and structural shapes	3.10c.
Soft steel bars	3.00c.
Reinforc'g bars, billet steel	1.90c. to 2.25c.
Reinforc'g bars, rail steel	1.85c. to 2.00c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.60c.
Flats and squares	4.10c.
Bands (⅞ in. in Nos. 10 and 12 gages)	3.20c.
Hoops (No. 14 gage and lighter)	3.75c.
Black sheets (No. 24)	4.05c.
Galv. sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.35c.
Spikes, ⅞ in. and larger	3.55c.
Track bolts	4.55c.
Rivets, structural	4.00c.
Rivets, boiler	4.00c.
	Per Cent Off List
Machine bolts	60
Carriage bolts	60
Coach or lag screws	60
Hot-pressed nuts, sq., tap. or blank	60
Hot-pressed nuts, hex., tap. or blank	60
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	$2.75 to 2.95
Cement c't'd nails, base per keg	2.75 to 2.95

ports, 25,000 tons for a new post office and a substantial tonnage for two of the World's Fair buildings, on which construction will be started in the spring. It is the impression of many here that such projects as the National Bank of the Republic Building and a structure for the Marshall Field Estate will also go ahead early in the spring. An encouraging situation recently brought to light by a survey made in Chicago is that rentable vacant property now stands at 4.70 per cent, whereas 10 per cent is usually considered a normal figure. While projects of the character listed here are taking shape, fabricators are faced with shortened hours of shop operation. Architects generally are busier, though their employment of added draftsmen will be set back for the reason that some of the work which they are putting into the market was prepared on drafting boards six months to a year ago. The expansion program of the Illinois Steel Co. is well under way, and steel has been ordered for the fabrication of the first units.

Mill prices on plain material, per lb.: 2.00c. base, Chicago.

Wire Products.—First quarter books are open, and prices named are 2.45c. a lb., Chicago, for bright annealed wire to the manufacturing trade and $2.45 to $2.55 a keg for wire nails in carload lots to the merchant trade. Insufficient time has elapsed since the opening of books to determine whether buyers are in the mood to make future commitments. In the meantime, specifications scarcely support mill operations at 50 per cent of capacity, a reduction of several points in the week. As to releases by the manufacturing trade, there are indications that the bottom in demand has been passed, though the change is not impressive. Jobbers, especially in the North and at some points in the West, find distribution cut by cold weather. The result is that for the country as a whole specifications from jobbers show a decline from the volume of a week ago.

Cold-Rolled Strip.—Current specifications are holding mill operations to about 20 per cent of capacity. Prices are steady at 2.75c. a lb., Cleveland, or 3.05c., delivered Chicago.

Bolts, Nuts and Rivets.—Among the interesting developments in this market is the fact that automobile parts makers are entering contracts for their needs over the next few months. Prices remain firm and contracts are being prepared on the basis of present quotations.

Plates.—More than 80,000 tons of steel will be required for 6000 cars ordered by the Rock Island and the Missouri Pacific. Five thousand cars were ordered by the Rock Island and 1000 by the Missouri Pacific. Fresh tank steel inquiries total 10,000 tons, of which 3000 tons is for a refinery in Louisiana. Orders for like projects are light in the aggregate for the week, being less than 1000 tons. Shipments of plates are larger to the Milwaukee pipe maker.

Reinforcing Bars.—An early spell of winter weather is serving to check plans for reinforced concrete work which otherwise might have been put under way in the near future. This situation, combined with the fact that this season is normally quiet, leaves bar benders with very small additions to books and a limited amount of new work on which they can prepare figures. Shop operations are at a lower rate than a week ago and further reduction in output is in sight. However, there are bright spots in this market. Easier money promises to support construction work at a higher rate than in the year now drawing to a close and road building programs in the Middle West promise the use of large tonnages of reinforcing bars. Prices for new billet and rail steel reinforcing bars are weak.

Bars.—There is little change in the mild steel bar market. Consumption is still widespread, but purchases are in small lots. Car builders are taking limited quantities in efforts to hold stocks at a low point at the turn of the year. Orders for alloy steel bars are more numerous, but the aggregate tonnage is small, and little support is being lent to mills, which are operating at low rates of output. There is a steady use of iron bars by railroads and car builders. Producers of rail steel bars have opened books for the first quarter at 1.90c. a lb., Chicago Heights. Spot buying is in larger volume, and specifications, though individually small, are greater in the aggregate than a week ago. Although books have been opened, insufficient time has elapsed to gage the interest shown by users in future needs.

Coke.—November shipments of by-product foundry coke surpassed by a small margin the total in October. The December rate is well up to the average in recent weeks. Prices remain steady at $8 a ton, f.o.b. Chicago ovens.

Old Material.—Opinion is divided as to the course being taken by the Chicago scrap market. Sales are unusually small and therefore throw no light on the situation. Most users have been alert to the price situation in recent weeks and, while they may not have accumulated oversized stocks, they are now amply protected for some time to come by orders which are in the hands of brokers. Use of scrap in this district is still at a fair rate, as gaged by shipments and the fact that distress tonnage is giving very little trouble. Two factors which should have a bearing on stabilizing this market are restriction of preparation and shipments of scrap due to cold weather and low production of industrial scrap. Those in the trade who hold that cold weather is an important factor in the winter scrap business feel that zero weather already experienced will curtail shipments enough to lend stability to prices and probably make present quotations a turning point for a stronger market. Shipments to foundries are in smaller volume. This is due in part to the approach of the inventory period and also the fact that many foundries will be closed over the Christmas holiday season. Among railroad lists are 30,000 tons offered by the Pennsylvania on Dec. 4, blank lists by the New York Central and the Michigan Central and 3000 tons offered by the Chicago & North Western.

Prices deliv'd Chicago district consumers:

	Per Gross Ton	
Basic Open-Hearth Grades:		
Heavy melting steel	$12.50 to	$13.00
Shoveling steel	12.50 to	13.00
Frogs, switches and guards, cut apart, and misc. rails	13.00 to	13.50
Hydraul. compressed sheets	10.75 to	11.25
Drop forge flashings	9.75 to	10.25
No. 1 busheling	11.00 to	11.50
Forg'd cast and r'l'd steel carwheels	17.50 to	18.00
Railroad tires, charg. box size	17.50 to	18.00
Railroad leaf springs cut apart	17.50 to	18.00
Acid Open-Hearth Grades:		
Steel couplers and knuckles	16.00 to	16.50
Coil springs	18.00 to	18.50
Electric Furnace Grades:		
Axle turnings	12.75 to	13.25
Low phos. punchings	14.50 to	15.00
Low phos. plates, 12 in. and under	14.50 to	15.00
Blast Furnace Grades:		
Axle turnings	10.50 to	11.00
Cast iron borings	9.00 to	9.50
Short shoveling turnings	9.00 to	9.50
Machine shop turnings	6.50 to	7.00
Rolling Mill Grades:		
Iron rails	14.50 to	15.00
Rerolling rails	15.00 to	15.50
Cupola Grades:		
Steel rails less than 3 ft.	16.25 to	17.25
Steel rails less than 2 ft.	18.00 to	18.50
Angle bars, steel	15.25 to	15.75
Cast iron carwheels	13.50 to	14.00
Malleable Grades:		
Railroad	16.00 to	16.50
Agricultural	14.50 to	15.00
Miscellaneous:		
*Relaying rails, 56 to 60 lb.	23.00 to	25.00
*Relaying rails, 65 lb. and heav.	26.00 to	31.00
	Per Net Ton	
Rolling Mill Grades:		
Iron angle and splice bars	15.00 to	15.50
Iron arch bars and transoms	17.50 to	18.00
Iron car axles	25.50 to	26.00
Steel car axles	15.50 to	16.00
No. 1 railroad wrought	12.00 to	12.50
No. 2 railroad wrought	10.50 to	11.00
No. 1 busheling	9.00 to	9.50
No. 2 busheling	7.00 to	7.50
Locomotive tires, smooth	14.50 to	15.00
Pipes and flues	9.50 to	10.00
Cupola Grades:		
No. 1 machinery cast	13.50 to	14.00
No. 1 railroad cast	12.50 to	13.00
No. 1 agricultural cast	12.00 to	12.50
Stove plate	11.50 to	12.00
Grate bars	11.25 to	11.75
Brake shoes	9.75 to	10.25

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

Reconditioning of Six Ships Authorized

Washington, Dec. 3.—In anticipation of substantial increases in the movements of grain, cotton and flour from Gulf ports to Europe during the next several months, the Shipping Board has authorized the reconditioning of six steel cargo steamers now laid up. The ships will be ready for service within 60 days. The outlay authorized amounts to $414,000. The vessels are the Marne, the West Compo, the West Hassayampa, the West Munham, the City of Alma and the Arden.

New York

Pig Iron Melt Declining and This Is Reflected in Orders—Structural Steel Outlook Bright

NEW YORK, Dec. 3.—Pig iron melt, in the aggregate, is declining. It is difficult to ascertain whether the reduction is due to seasonal or cyclical causes or reflects unsettlement following the stock market crash. The falling off has not been general, however, and may indicate nothing more than the usual curtailment that occurs as the year-end approaches. Suspensions are somewhat more numerous, but, in view of the rather common policy of carrying very light stocks, have not involved large tonnages. Shipments of a leading seller in October were the largest for any month of the year. The tonnage moved in November, augmented by concluding barge canal shipments, was not far behind. With the season of navigation over on the State canal and with the inventory period approaching, the opening of December sees a distinct falling off in the amount of iron moved. Sales of the week in this district were light, totaling 4500 tons, and inquiries are not numerous. The trade is encouraged, however, by the fact that several buyers have tentatively asked for prices on their first quarter requirements, aggregating 3000 to 4000 tons. With furnaces being put out in step with declining demand, sellers believe that the market will be kept free from the weakening effect of large accumulations of stock iron in producers' hands. In the absence of tests the price situation is substantially unchanged. The American Locomotive Co. has placed 500 tons for its Dunkirk, N. Y., works with a Buffalo stack.

Prices per gross ton, delivered New York district:

Buffalo No. 2 fdy., sil. 1.75 to 2.25	$21.91 to $22.41
*Buff. No. 2, del'd east. N. J.	20.28 to 20.78
East. Pa. No. 2 fdy., sil. 1.75 to 2.25	$19.89 to 21.02
East. Pa. No. 2X fdy., sil. 2.25 to 2.75	20.39 to 21.52

Freight rates: $4.91 from Buffalo, $1.39 to $2.52 from eastern Pennsylvania.

*Prices delivered to New Jersey cities having rate of $3.28 a ton from Buffalo.

Reinforcing Bars.—The Turner Construction Co., which has the general contract for the new Ford assembly plant at Edgewater, N. J., has not yet placed an order for the 1000 tons of bars which will be required. Likewise, no award has been made for 1000 tons of bars for an addition to the Pennsylvania terminal and warehouse at Hoboken, N. J. Another good-sized pending job is 600 tons for a warehouse under construction at Newark, N. J., by the Lehigh Valley Transportation Co. The volume of small jobs let in the past few weeks has declined, but prices are steady at 2.05c., New York.

Warehouse Business.—November sales from warehouse stocks were smaller than the October total. Structural steel demand has been steadily receding. Sheets are inactive, but prices are being fairly well maintained, except on blue annealed, which are subject to concessions from the scheduled quotation of 3.90c. a lb., base, to 3.25c. a lb., base, on desirable specifications.

Finished Steel.—A number of mills have begun the solicitation of first quarter contracts, but without much success. Consumers generally are not willing to commit themselves, but whether this policy is dictated by uncertainty as to requirements in the early part of the year or is due to the expectation of lower prices is not clear. Prices are holding fairly well, considering the fact that all mills are anxious for orders. There is naturally some irregularity, but no serious defection. Leading makers of blue annealed sheets have notified local sales offices that minimum prices henceforth are 2.35c. a lb., Pittsburgh, for No. 13 gage and 2.20c. for No. 10. These prices refer to the jobbing mill products, which recently have been brought into sharp competition with the product of the continuous mills. Black sheets are holding fairly well at 2.75c., though occasional sales are made at 2.70c. Galvanized sheets are well maintained at 3.40c. Plate prices are fairly steady at 2c. to 2.05c., Coatesville, the higher price applying on small lots. Some bar quotations below 1.90c., Pittsburgh, have appeared. No definite trend in the volume of business is discernible. Some local offices did better in November than in October, but on the whole the volume of the latter half of November showed no marked change from that of the first half. The structural steel outlook is described by leading fabricators as more favorable than at this time last year. A large volume of work is expected to come out for bids within 60 days, and considerable work on which bids have gone in may be closed before the end of the year. Outstanding among pending jobs is the Empire State Building, which will take 40,000 to 45,000 tons of steel, award of which may be made soon.

Mill prices per lb., deliv'd New York: Soft steel bars, 2.24c.; plates, 2.17½c. to 2.22½c.; structural shapes, 2.09½c. to 2.14½c.; bar iron, 2.14c.

Cast Iron Pipe.—Prices are still lacking in strength, with most foundries in the North and South in need of tonnage and buying limited to less than carload lots. The only sizable inquiry is for about 1300 tons of 4-in., 8-in. and 10-in. pipe for a city water system in Mexico. Hartford, Conn., has opened bids on about 200 tons of 12-in. water pipe, either sand cast or centrifugal.

Prices per net ton deliv'd New York: Water pipe, 6-in. and larger, $34.60 to $36.60; 4-in. and 5-in., $37.60 to $39.60; 3-in., $44.60 to $46.60. Class A and gas pipe $3 extra.

Coke.—Renewal of contracts for the first half of next year has been general, but demand for carload lots for prompt shipment is small. The price is unchanged at $4.85 a net ton, ovens, for special brands of beehive foundry coke, or $8.56, delivered to northern New Jersey, Jersey City and Newark, and $9.44, to New York and Brooklyn. Standard furnace coke is quiet at $2.65 a net ton. By-product coke is quoted at $9 to $9.40 a net ton, Newark or Jersey City, and $10.06, New York or Brooklyn.

Warehouse Prices, f.o.b. New York

	Base per Lb.
Plates and structural shapes	3.30c.
Soft steel bars, small shapes	3.25c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	7.00c. to 7.25c.
Cold-fin. shafting and screw stock—	
Rounds and hexagons	3.50c.
Flats and squares	4.00c.
Cold-roll. strip, soft and quarter hard	5.15c. to 5.40c.
Hoops	4.25c.
Bands	3.75c.
Blue ann'l'd sheets (No. 10)	3.25c. to 3.90c.
Long terne sheets (No. 24)	5.80c.
Standard tool steel	12.00c.
Wire, black annealed	4.50c.
Wire, galv. annealed	5.15c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ¼ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.

	Per Cent Off List
Machine bolts, cut threads:	
¾ x 6 in. and smaller	60
1 x 30 in. and smaller	50 to 50 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	60
¾ x 20 in. and smaller	50 to 50 and 10
Coach Screws:	
½ x 6 in. and smaller	60
1 x 6 in. and smaller	50 to 50 and 10

	Per 100 Ft.
Boiler Tubes—	
Lap welded, 2-in.	$17.33
Seamless steel, 2-in.	20.24
Charcoal iron, 2-in.	25.00
Charcoal iron, 4-in.	67.00

Discounts on Welded Pipe

Standard Steel—	Black	Galv.
½-in. butt	46	29
¾-in. butt	51	37
1-3-in. butt	53	39
2½-6-in. lap	48	35
7 and 8-in. lap	44	17
11 and 12-in. lap	37	12
Wrought Iron—		
½-in. butt	5	+19
¾-in. butt	11	+ 9
1-1½-in. butt	14	+ 6
2-in. lap	5	+14
3-6-in. lap	11	+ 6
7-12-in. lap	3	+16

Tin Plate (14 x 20 in.)

	Prime	Seconds
Coke, 100 lb. base box	$6.45	$6.20
Charcoal, per Box—	A	AAA
IC	$9.70	$12.10
IX	12.00	14.25
IXX	13.90	16.00

Terne Plate (14 x 20 in.)

IC—20-lb. coating	$10.00 to $11.00
IC—30-lb. coating	12.00 to 13.00
IC—40-lb. coating	13.75 to 14.25

Sheets, Box Annealed—Black, C. R. One Pass

	Per Lb.
Nos. 18 to 20	3.70c.
No. 22	3.85c.
No. 24	3.90c.
No. 26	4.00c.
No. 28*	4.15c.
No. 30	4.40c.

Sheets, Galvanized

	Per Lb.
No. 14	4.15c.
No. 16	4.00c.
No. 18	4.15c
No. 20	4.25c.
No. 22	4.35c.
No. 24	4.50c.
No. 26	4.75c.
No. 28*	5.00c.
No. 30	5.40c.

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

Old Material.—Buying prices show a further downward trend, with brokers in most cases offering only $14 a ton, delivered, for No. 1 heavy melting steel delivered to consumers at Bethlehem or Coatesville, Pa. Heavy breakable cast also shows a decline, brokers offering $13.75 a ton, delivered to a consumer at Florence, N. J., and $13.50 a ton, delivered eastern Pennsylvania. Buying of other grades is unimportant.

Dealers' buying prices per gross ton, f.o.b. New York:

No. 1 heavy melting steel	$11.00 to $11.35
Heavy melting steel (yard)	8.00 to 8.50
No. 1 hvy. breakable cast	10.25 to 11.00
Stove plate (steel works)	8.00
Locomotive grate bars	8.25
Machine shop turnings	7.00 to 7.50
Short shoveling turnings	7.25 to 7.50
Cast borings (blast fur. or steel works)	7.00 to 7.50
Mixed borings and turnings	6.75 to 7.50
Steel car axles	15.25 to 16.25
Iron car axles	21.00 to 21.50
Iron and steel pipe (1 in. dia., not under 2 ft. long)	9.75
Forge fire	8.50 to 9.00
No. 1 railroad wrought	12.00 to 12.50
No. 1 yard wrought, long	11.00 to 11.50
Rails for rolling	11.50 to 12.00
Stove plate (foundry)	8.25 to 9.00
Malleable cast (railroad)	13.50 to 14.00
Cast borings (chemical)	9.00 to 9.50

Prices per gross ton, deliv'd local foundries:

No. 1 machry. cast	$15.00 to $15.50
No. 1 hvy. cast (columns, bldg. materials, etc.), cupola size	13.00 to 13.50
No. 2 cast (radiators, cast boilers, etc.)	12.50 to 13.00

New German Bar Mill Undersells Syndicate

HAMBURG, GERMANY, Nov. 18.—A published report that the Rheinmetall A. G., which has just started operation of a new steel bar mill with a capacity of 35,000 tons annually, has become a member of the German Steel Syndicate is denied by the company. The entire output of the mill, it is announced, is being distributed through Kaufmann & Lipman, steel merchants of this city, at slightly less than the official syndicate prices.

Number of German Blast Furnaces Decreasing

HAMBURG, GERMANY, Nov. 18.—The total number of blast furnaces in Germany continues to decline as old small-capacity furnaces are dismantled and replaced with large modern furnaces. At the end of October there were 182 furnaces in existence, compared with 185 at the end of September. Since 1924, 51 old furnaces have been dismantled and 19 new stacks blown in.

Broken Hill Proprietary Buys German Engines

HAMBURG, GERMANY, Nov. 18.—A contract to furnish six Diesel engines for a new power plant of the Broken Hill Proprietary Co. in Australia has been awarded to Gebrüder Sulzer, leading German manufacturers of Diesel engines. Each motor will develop 2900 hp., and four Diesel compressor engines, also to be furnished in the contract, will develop 1230 hp. The maximum horsepower of the new power plant will be 27,800.

Cleveland

Slight Pickup in Orders for Steel from Automobile Industry —Resumption Expected to Be Slow

CLEVELAND, Dec. 3.—A slight improvement in releases from the automotive industry developed during the week, permitting a little gain in operations by a few of the mills. Others are going along at their recent rate. While the gain is not enough to indicate a permanent improvement, sentiment in the automotive industry in the Michigan territory is much better than a month ago.

December output of motor cars will show a gain over that of November in view of the fact that the Ford and Chevrolet companies are getting under production in a limited way on their new models. However, the pickup in this industry doubtless will be slow. Both the Ford and Chevrolet companies are ordering more steel than last month, but orders from these companies, as well as other automobile manufacturers, are for small lots covering only early requirements.

Stocks of all consumers are low and quick shipment is usually called for. A great deal of steel is still being held up by automobile manufacturers, from which mills are not securing releases.

An independent Cleveland mill that was practically shut down last week is operating at close to 50 per cent this week in both its steel making and finishing mill departments, but another has further reduced its open-hearth operations. Together, local independent mills are operating at about 30 per cent of ingot capacity.

While a few of the bar, plate and shape mills and most of the sheet and strip mills have named present prices for the first quarter, they are not trying to close contracts and consumers are showing no interest in future commitments. Announcements of first quarter prices made during the week included furniture sheets and vitreous enameling stock. Some bolt and nut and rivet makers have reaffirmed present prices for the first quarter.

Pig Iron.—Sales by Cleveland interests were 10,350 tons during the week, compared with 6250 tons the week before. The business was about evenly divided between early shipment orders and first quarter contracts. While some consumers are willing to contract for the coming quarter at current prices, others are holding off to see if present prices are maintained. The market so far appears to be holding firm at recent quotations. The only activity in the immediate territory was the purchase of 500 tons of foundry iron by a northern Ohio foundry at $18.50, furnace, the business being divided between two furnaces. November shipments fell off about 15 per cent, compared with October. Shipping orders from some of the automobile foundries for December show a gain, and this industry is expected to take more iron this month than during last month. However, shipments to other foundries will probably be light this month, as there will be the usual disposition to keep stocks low at inventory time. Many of the northern Ohio foundries are operating three to four days a week. While a few consumers will carry over enough iron to last them well into the first quarter, the aggregate will not be large, as buying for the present quarter was rather light. The American Steel & Wire Co. has blown out one of its Central furnaces in Cleveland. Foundry and malleable iron are quoted at $18.50, Cleveland, for outside shipment and $19, furnace, for local delivery. In Michigan there is a spread of from $19.50 to $20, furnace, for these grades.

Prices per gross ton at Cleveland:

N'th'n fdy., sil. 1.75 to 2.25	$19.50
S'th'n fdy., sil. 1.75 to 2.25	$19.51 to 20.51
Malleable	19.50
Ohio silvery, 8 per cent	28.00
Basic Valley furnace	18.50
Stand. low phos., Valley	26.50 to 27.00

Prices except on basic and low phosphorus are delivered Cleveland. Freight rates: 50c. from local furnaces; $3 from Jackson, Ohio; $6.01 from Birmingham.

Iron Ore.—The Lake shipping season has closed, with a total ore movement by water of 65,195,478 tons, breaking all previous records for shipment by water. More detailed report on ore shipments will be found in another column.

Sheets.—While a few of the mills are operating a little better this week than last, the improvement is slight. Some independent mills in this district are operating at only about 35 per cent capacity. There is a moderate improvement in orders from the automotive industry. Enameling sheets are moving fairly well. The present 3.90c., Pittsburgh, price has been reestablished on vitreous enameling stock for the first quarter. Some mills have named 4c. for metal furniture sheets for that delivery and others are asking 4.10c. Black and

Warehouse Prices, f.o.b. Cleveland

	Base per Lb.
Plates and struc. shapes	3.00c.
Soft steel bars	3.00c.
Reinforc. steel bars	2.25c. to 2.50c.
Cold-fin. rounds and hex.	3.65c.
Cold-fin. flats and sq.	4.15c.
Hoops and bands, No. 12 to $\frac{1}{4}$ in., inclusive	3.25c.
Hoops and bands, No. 13 and lighter	3.65c.
Cold-finished strip	*5.95c.
Black sheets (No. 24)	2.70c. to 2.90c.
Galvanized sheets (No. 24)	4.60c. to 4.75c.
Blue ann'l'd sheets (No. 10)	3.25c.
No. 9 ann'l'd wire, per 100 lb.	$2.65
No. 9 galv. wire, per 100 lb.	3.00
Com. wire nails, base per keg	2.65

*Net base, including boxing and cutting to length.

blue annealed sheets are firmer than recently. The former are holding to 2.75c., Pittsburgh, but the price spread on the latter still exists.

Strip Steel.—A few hot-rolled strip mills are running somewhat better this week than last, but do not have enough tonnage to maintain present operations long. Cold-rolled strip is moving very slowly. Occasional concessions from 1.90c. for wide and 2c. for narrow hot-rolled strip are being made. Cold-rolled strip appears firm at 2.75c., Cleveland. Naming of present prices on hot and cold-rolled strip for the first quarter has not brought out any business for that delivery.

Semi-Finished Steel.—Specifications for billets, sheet bars and slabs are still very light and there is no new business to test prices, nor is there interest in first quarter contracts. Wire rods have been reestablished at $40, Cleveland, for the first quarter.

Wire Products.—A limited amount of wire business has been taken for the first quarter at the reestablished 2.40c., Cleveland, price, which is firm for current orders. Demand is steady, but is for small lots. Nails are inactive.

Reinforcing Bars.—Demand is limited to small lots. The market is weak, a 100-ton lot that was placed during the week having brought out a lower price than had appeared recently.

Bars, Plates and Shapes.—Demand for steel bars continues very light. Some of the mills are doing better in light plates than recently as a result of orders from the automotive industry, but the demand for tank and boiler plate is dull. Shapes continue to move fairly well. New inquiry in the building field is light. Some mills have named present prices on steel bars, plates and shapes for the first quarter and others indicate their willingness to take business at these prices. Steel bars are quoted at 1.85c. to 1.90c., Cleveland, and plates and shapes at 1.90c., Pittsburgh.

Warehouse Prices, f.o.b. Philadelphia

	Base per Lb.
Plates, ¼-in. and heavier	2.70c.
Plates, ⅜-in.	2.90c.
Structural shapes	2.70c.
Soft steel bars, small shapes, iron bars (except bands)	2.80c.
Round-edge iron	3.50c.
Round-edge steel, iron finished 1½ x 1½ in.	3.50c.
Round-edge steel planished	4.30c.
Reinforc. steel bars, sq., twisted and deform.	2.60c. to 2.80c.
Cold-fin. steel, rounds and hex.	3.50c.
Cold-fin. steel, sq. and flats	4.00c.
Steel hoops	3.55c.
Steel bands, No. 12 to ⅜-in. inclus.	3.30c.
Spring steel	5.00c.
*Black sheets (No. 24)	3.90c.
†Galvanized sheets (No. 24)	4.65c.
Light plates, blue annealed (No. 10)	3.25c.
Blue ann'l'd sheets (No. 13)	3.40c.
Diam. pat. floor plates—	
¼-in.	5.30c.
⅜-in.	5.50c.
Rails	3.20c.
Swedish iron bars	6.60c.

*For 50 bundles or more; 10 to 49 bun., 4.10c. base; 1 to 9 bun., 4.35c. base.
†For 50 bundles or more; 10 to 49 bun., 4.95c. base; 1 to 9 bun., 5.30c. base.

Bolts, Nuts and Rivets.—No announcement as to next year's prices on bolts and nuts has appeared. However, no change is expected. Orders are still extremely light, and there is no evidence as yet of an increased demand from the automotive industry. Rivets are moving in fair volume.

Coke.—Foundry coke is inactive, but prices appear to be holding at recent quotations. By-product coke for domestic use is fairly active and is maintained at $4.75, Ohio ovens, for egg and $4.50 for nut. Ohio by-product foundry coke is quoted at $8.25, ovens.

Old Material.—About the only activity is in a limited amount of distress scrap, largely from the Detroit territory, which is being sold at somewhat under prices that have been prevailing. A small lot of compressed sheet steel scrap was sold in Cleveland during the week at $12.50. Dealers are still able to ship a small amount of scrap to two or three mills, although virtually none is being taken by mills in the Cleveland and Valley districts. The market has a weak tone, but in the absence of transactions most quotations are unchanged.

Prices per gross ton delivered consumers' yards:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.00 to $14.50
No. 2 heavy melting steel	13.50 to 13.75
Compressed sheet steel	13.50 to 14.00
Light bundled sheet stampings	12.00 to 12.50
Drop forge flashings	11.50 to 12.00
Machine shop turnings	9.00 to 9.75
Short shoveling turnings	11.50 to 12.00
No. 1 railroad wrought	13.00 to 13.50
No. 2 railroad wrought	14.00 to 14.50
No. 1 busheling	12.50 to 13.00
Pipes and flues	9.00 to 9.50
Steel axle turnings	12.50 to 13.00
Acid Open-Hearth Grades:	
Low phos., forging crops	17.75 to 18.00
Low phos., billet, bloom and slab crops	18.50 to 18.75
Low phos., sheet bar crops	18.00 to 18.50
Low phos., plate scrap	18.00 to 18.50
Blast Furnace Grades:	
Cast iron borings	10.00 to 10.50
Mixed borings and short turnings	10.00 to 10.50
No. 2 busheling	10.00 to 10.50
Cupola Grades:	
No. 1 cast	17.00 to 17.50
Railroad grate bars	11.00 to 12.00
Stove plate	12.00 to 12.50
Rails under 3 ft.	18.50 to 19.50
Miscellaneous:	
Railroad malleable	18.00 to 18.50
Rails for rolling	16.25 to 16.50

Philadelphia

Consumers of Steel and Pig Iron Delay Contracting—Shipbuilding Active—Ferromanganese Reduced

PHILADELPHIA, Dec. 3.—Steel mill operations still show a tendency to recede, many consumers being inclined to await a definite trend toward business improvement before entering into any commitments for next year. Structural steel buying has slackened. Sheet prices, especially blue annealed, are slightly more stable than a week ago, and mills are not offering as drastic concessions to automobile manufacturers and other large buyers.

Prospective shipbuilding continues a feature of the market, with the New York Ship Building Corporation, Camden, N. J., low bidder on two large ships for the United States Lines, the Erie Railroad about to close on four tugs requiring 150 tons each of plates and the Mathis Yacht Building Co., Camden, N. J., building a private yacht requiring 160 tons of plates.

Ferromanganese.—Effective yesterday, domestic producers of ferromanganese began quoting $100 a ton, seaboard, on contracts for 1930, and British sellers have received instructions to meet the new level on future contracts. Buying for next year's requirements has begun to develop with domestic producers, but importers have not closed much tonnage.

Pig Iron.—Consumers of foundry iron show no interest in contracting for first quarter and in some instances have requested temporary postponement of scheduled deliveries on contracts because of year-end inventories. Delays in contracting for next year are attributed to the lower operating rates of foundries and a resulting surplus of iron due on contracts. The Textile Machinery Corporation, Reading, Pa., has closed on 1000 tons of foundry iron with eastern Pennsylvania furnaces. Prices of foundry iron are unchanged at $21 a ton, base, for small lots, with occasional concessions on desirable business or to meet Southern competition. Demand for low phosphorus iron is fair and furnaces which depend upon foreign sources for supplies of low phosphorus iron ore have been encountering difficulty in obtaining shipments, even on high-priced contracts. The American Steel & Wire Co., Worcester, Mass., recently closed on about 1000 tons of low phosphorus iron with a New York State furnace, and the Brooklyn Navy Yard has awarded 200 tons of low phosphorus to a Delaware River furnace.

Prices per gross ton at Philadelphia:

East. Pa. No. 2, 1.75 to 2.25 sil.	$21.26 to $21.76
East. Pa. No. 2X, 2.25 to 2.75 sil.	21.76 to 22.26
East. Pa. No. 1X	22.26 to 22.76
Basic (del'd east. Pa.)	19.75 to 20.25
Gray forge	20.00 to 20.50
Malleable	21.25 to 21.75
Stand. low phos. (f.o.b. N. Y. State furnace)	22.00 to 23.00
Cop. br'g low phos. (f.o.b. furnace)	23.50 to 24.00
Va. No. 2 plain, 1.75 to 2.25 sil.	22.29
Va. No. 2X, 2.25 to 2.75 sil.	22.79

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 76c. to $1.64 from eastern Pennsylvania furnaces; $4.54 from Virginia furnaces.

Bars.—Buying is limited to small lots, on which sellers are maintaining 1.90c., Pittsburgh, or 2.22c. a lb., delivered Philadelphia.

Reinforcing Bars.—The number of new projects requiring reinforced con-

crete is decreasing with the approach of winter. Several hundred tons of bars for a bulkhead on the Schuylkill River being built by Philadelphia are reported to have been placed with the Truscon Steel Co. Prices are unchanged at 1.95c. a lb., Pittsburgh, or 2.27c., delivered Philadelphia, for billet steel bars, with the extra for cutting to length usually omitted. Occasionally this price is subject to slight shading. Rail steel bars are quoted at 1.85c. to 1.95c., Franklin, Pa., and Tonawanda, N. Y., or 2.17c. to 2.27c., delivered Philadelphia, with no extra for cutting to length or bending.

Shapes. — Fabricating shops are still well engaged, but are bidding on a reduced tonnage of new projects. Shape mills are maintaining fair rates of operation on small sizes, but in most cases need tonnage in large shapes. Prices continue at 1.90c. to 1.95c., f.o.b. nearest mill to consumer, or 1.96c. to 2.01c. a lb., delivered Philadelphia.

Old Material.—Buying of all grades of scrap is small, consumers showing no desire to enter into contracts. A Pencoyd, Pa., mill has purchased a small tonnage of No. 2 automobile steel at $13.50 a ton, delivered, and a Phoenixville, Pa., consumer has bought stove plate at $11 a ton, delivered.

Prices per gross ton delivered consumers' yards, Philadelphia district:

No. 1 heavy melting steel	$14.50 to $15.00
Scrap T rails	14.00 to 14.50
No. 2 heavy melting steel	12.00 to 13.00
No. 1 railroad wrought	15.50 to 16.00
Bundled sheets (for steel works)	11.50
Hydraulic compressed, new	13.50 to 14.00
Hydraulic compressed, old	12.00 to 12.50
Machine shop turnings (for steel works)	11.00
Heavy axle turnings (or equiv.)	12.50 to 13.50
Cast borings (for steel works and roll. mill)	11.00 to 11.50
Heavy breakable cast (for steel works)	14.00
Railroad grate bars	12.00 to 12.50
Stove plate (for steel works)	11.00 to 11.50
No. 1 low phos., hvy., 0.04% and under	21.00 to 22.00
Couplers and knuckles	19.00 to 19.50
Rolled steel wheels	19.00 to 19.50
No. 1 blast f'nace scrap	10.50 to 11.00
Wrot. iron and soft steel pipes and tubes (new specific.)	14.00
Shafting	19.00
Steel axles	20.00 to 21.00
No. 1 forge fire	13.00 to 13.50
Cast iron carwheels	15.50 to 16.00
No. 1 cast	15.00 to 15.50
Cast borings (for chem. plant)	14.00 to 14.50
Steel rails for rolling	16.50 to 17.00

Plates. — The price has generally settled to 2c. a lb., Coatesville, Pa., or 2.10c. a lb., delivered Philadelphia, which mills are endeavoring to maintain as the contract price for first quarter. Small lots of miscellaneous specifications still bring 2.05c., Coatesville, Pa., or 2.15c., delivered Philadelphia.

Sheets.—Automobile body builders in this district have been placing small orders for blue annealed and high finished sheets, but otherwise the sheet market is inactive. Prices are slightly more stable than a week ago and blue annealed sheets are quoted at 2.35c. a lb., Pittsburgh, or 2.67c., delivered Philadelphia, for No. 13 gage, and blue annealed plates at 2.20c., Pittsburgh, or 2.52c., delivered Philadelphia, for No. 10 gage. Concessions of $2 to $4 a ton are granted to preferred buyers. Black sheets range from 2.70c. Pittsburgh, or 3.02c., Philadelphia to 2.75c., Pittsburgh, or 3.07c., Philadelphia. Galvanized sheets are quiet and the price fairly steady at 3.40c., Pittsburgh, or 3.72c., Philadelphia.

Imports.—In the week ended Nov. 30, 5080 tons of manganese ore arrived at this port from British West Africa and 2024 tons of chrome ore was received, of which 1300 tons came from Greece and 724 tons from British South Africa. Pig iron imports consisted of 1545 tons from British India and 737 tons from the United Kingdom. The only steel arrival was three tons of scrap from the United Kingdom.

Castings, Babbitt and Equipment

	October, 1929	September, 1929	October, 1928
Malleable castings production (a), net tons	60,165	59,589	70,054
do., do., ten months	727,146	.....	656,489
do., shipments, net tons	52,092	63,049	62,510
do., orders booked	58,051	52,957	65,780
do., do., ten months	698,880	.....	638,044
Babbitt metal consumption (a), net tons	2,739	2,613	2,898
do., ten months	28,616	.....	24,530
Mechanical stoker sales (a), number	178	155	100
do., horsepower	56,108	45,685	27,219
do., ten months	515,140	.....	428,539
Electric trucks and tractors shipped (a)	169	160	134
do., ten months	1,754	.....	1,181

(a) United States Department of Commerce.

New Prices Announced for Ferroalloys

New prices for the major ferroalloys were made effective Dec. 2 and rule for contracts for 1930 requirements. A reduction of $5 a ton on ferromanganese brings the new quotation to $100, seaboard. Prices for ferrosilicon (50 per cent) are unchanged at $83.50 a ton, delivered. There is no change in the price of the higher carbon ferrochromium, which stands at 11c. a lb. of contained chromium on contract and 11½c. for spot delivery. Reductions, however, have been made in the lower carbon grades of about 3c. a lb.

The new quotation on ferrochromium containing 0.10 per cent carbon as the maximum is 26c. a lb. of contained chromium, as against 29c. formerly, and the new price on the product containing 0.06 per cent carbon is 28c., as against 31c. formerly asked. Contracts closed for next year's requirements include some for spiegeleisen at an unchanged price.

Ore Imports Far Above Last Year

WASHINGTON, Nov. 25.—Imports of iron ore in October totaled 270,279 tons, Chile providing 153,283 tons. Cuba ranked second with 46,000 tons and Sweden third with 35,914 tons. The month's total was an increase of nearly 10 per cent from the 246,917 tons of September, and of almost 60 per cent from a year ago.

For the 10 months of 1929 the total incoming movement of iron ore was 2,584,403 tons, against 2,057,103 tons for the corresponding period of last year. Chile supplied 1,351,836 tons in the 10-month period of 1929, against 1,170,100 tons in the corresponding period of 1928.

Ten months' imports this year have exceeded the total for all of last year —2,485,046 tons. Except for 1927, with 2,620,717 tons, and 1923, with 2,768,430 tons, no recent full year has reached the 10-month figure of 1929, and both those years showed smaller 10-month totals than the present.

SOURCES OF AMERICAN IMPORTS OF IRON ORE
(In Gross Tons)

	October		10 Months Ended October	
	1929	1928	1929	1928
Chile	153,283	91,000	1,351,836	1,170,100
Cuba	46,000	11,500	532,350	277,286
Spain	4,626	7,557	48,885	29,765
Sweden	35,914	.....	274,744	19,614
French Africa	.....	41,500	141,795	403,630
Canada	40	.....	3,443	45,359
Other countries	30,416	18,345	231,350	111,349
Total	270,279	169,902	2,584,403	2,057,103

Pacific Coast

San Diego Pipe Line Calls for 10,000 Tons of Steel—Prices on Most Products Holding Well

SAN FRANCISCO, Nov. 30.—(*By Air Mail.*)—Activity in the Pacific Coast iron and steel markets this week was interrupted by the Thanksgiving holiday and, as a result, both awards and inquiries fell off. Plate fabricators are interested in the call for bids for approximately 10,000 tons of plates for a pipe line at San Diego. Prices in most lines are holding well, structural shapes and mild steel bars being firm at 2.35c., c.i.f.

Pig Iron. — Foundry operations among the jobbing plants are slack and little new business is coming to hand. As a result, melters are not inclined to order material in advance, most of them having fair-sized stocks in foundry yards. Prices are unchanged.

Prices per gross ton at San Francisco:

*Utah basic	$25.00 to $26.00
*Utah fdy., sil. 2.75 to 3.25	25.00 to 26.00
**Indian fdy., sil. 2.75 to 3.25	25.00 to 26.00

*Delivered San Francisco.
**Duty paid, f.o.b. cars San Francisco.

Bars.—Most of the reinforcing steel bar awards this week were in lots ranging from 20 to 60 tons. The Soule Steel Co. booked 350 tons for the Sears, Roebuck & Co. building in Oakland. Bids will be opened Dec. 18 for 306 tons for paving work in Los Angeles County. The Puget Sound Bridge & Dredging Co. secured the general contract for the Fourteenth Avenue South bridge, Seattle, calling for 200 tons.

Plates.—The Beall Tank & Pipe Co. secured 370 tons for the Cedar River pipe line No. 2 at Seattle. The only other award of importance called for 300 tons for one 85,000-bbl. tank at the Mount Poco field, Cal., for the Petroleum Securities Co., placed with an unnamed interest. Bids will be opened Dec. 23 for the Otay pipe line project at San Diego. This calls for 36 to 40-in. welded steel, reinforced concrete or cast iron pipe. Steel specifications call for material ranging in thickness from 3/16 to ⅝ in. It is estimated that approximately 10,000 tons will be required. Prices are weak, concessions of $2 to $4 a ton from the nominal quotation of 2.35c., c.i.f., being common on desirable lots.

Shapes. — Bookings of structural shapes this week were considerably below the weekly average for the year. The Pacific Iron & Steel Co. will furnish 500 tons for a new plant for itself at Los Angeles and 110 tons for condenser supports for the Texas Co. at Wilmington, Cal. The Union Pacific Railroad placed 450 tons for a freight depot in Los Angeles with the Minneapolis-Moline Power Implement Co. Dyer Brothers secured 273 tons for a crossing at California Park and 100 tons for a school in San Francisco. The Puget Sound Bridge & Dredging Co. took the general contract for the Fourteenth Avenue South bridge, Seattle, involving 1000 tons. Domestic shapes are firm at 2.35c., c.i.f.

Cast Iron Pipe.—Only two cast iron pipe awards of over 100 tons were reported this week. The National Cast Iron Pipe Co. took 141 tons of 8-in. Class 150 and 16-in. Class B pipe for the East Bay Municipal Utility District, Oakland, Cal. San Diego, Cal., placed 138 tons of 6-in. Class C pipe for Fortieth Street with the Butterfield Construction Co. The American Cast Iron Pipe Co. was low bidder on 1088 tons of 12-in. Class A pipe for Los Angeles. The Griffith Co. was low bidder on 230 tons of 4 and 6-in. Class C pipe for Coronado Avenue, San Diego. The National Cast Iron Pipe Co. was low bidder on 477 tons of 4 to 10-in. Class B pipe for Miramonte Park, Los Angeles. Bids will be opened on Dec. 23 for 3400 tons of 36-in. Class B pipe for the Otay pipe line project, San Diego. Alternate bids will be taken on reinforced concrete and welded steel pipe.

Warehouse Prices, f.o.b. San Francisco

	Base per Lb.
Plates and struc. shapes	3.30c.
Soft steel bars	3.30c.
Small angles, ⅞-in. and over	3.15c.
Small angles, under ⅞-in.	3.55c.
Small channels and tees, ¾-in. to 2¾-in.	3.75c.
Spring steel, ¼-in. and thicker	5.00c.
Black sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.80c.
Galv. sheets (No. 24)	5.30c.
Struct. rivets, ½-in. and larger	5.65c.
Com. wire nails, base per keg	$3.40
Cement c't'd nails, 100 lb. keg	3.40

St. Louis

Southern Pig Iron Sold for First Quarter—Spurt in Coke Buying—Scrap Market Stagnant

ST. LOUIS, Dec. 3.—Sales of pig iron during the last week were rather light and consisted largely of spot orders for fill-in purposes. A few sales of Southern iron, including one of 200 tons, were made for first quarter shipment, Southern makers having opened their books for next year's business at prices ranging from $14 to $14.50, f.o.b. Birmingham. Makers report that melters are showing some interest in their first quarter requirements, and are optimistic over the outlook for next year. Stove plants, which recently slowed down operations, are hopeful that the cold snap of last week will tend to stimulate buying by consumers and in turn help the manufacturers to resume full operations. Malleable casting plants in the district catering to the automobile industry have curtailed their melt considerably, but the implement business is well sustained.

Prices per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$19.50 to $20.00
Malleable, f.o.b. Granite City	20.00
N'th'n No. 2 fdy., deliv'd St. Louis	22.16
Southern No. 2 fdy., deliv'd	18.42 to 18.92
Northern malleable, deliv'd	22.16
Northern basic, deliv'd	22.16

Freight rates: 75c. (average) Granite City to St. Louis; $2.16 from Chicago; $4.42 from Birmingham.

Finished Iron and Steel.—The demand for sheets is not so large as it was a few weeks ago, but the Granite City Steel Co. feels that this is due to a considerable extent to a desire of manufacturers and jobbers to decrease their inventories before the end of the year. Because of weather conditions, the demand for galvanized sheets, a large percentage of which goes into roofing, also has declined. Orders for tin plate have been large, as is expected at this time of year. The demand for plates also has been good. Building construction continues quiet.

Coke.—Cold weather has stimulated buying of domestic grades of coke, and by-product ovens have been enjoying exceptionally good business. Smelters continue to buy heavily of furnace coke, but buying of foundry grades is light.

Old Material.—The market for old material is at a standstill. Not only is there virtually no buying by consumers, but three of the largest mills in the district are asking dealers to withhold shipments against contracts. This the dealers are doing, although some of the railroads are insisting on making shipments of materials bought by dealers against these contracts. Country dealers, too, are being asked by local dealers to withhold shipments. Prices are nominally unchanged be-

Warehouse Prices, f.o.b. St. Louis

	Base per Lb.
Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.15c.
Cold-fin. rounds, shaftings, screw stock	3.75c.
Black sheets (No. 24)	4.25c.
Galv. sheets (No. 24)	5.10c.
Blue ann'l'd sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	4.30c.
Galv. corrug. sheets	5.15c.
Structural rivets	4.15c.
Boiler rivets	4.15c.
	Per Cent Off List
Tank rivets, ⅞-in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	60
Carriage bolts	60
Lag screws	60
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	60
Less than 200 lb.	50

cause of lack of sales, but probably would be on a lower basis if any were made. Railroad lists: Pennsylvania, 36,685 tons; Baltimore & Ohio, 16,520 tons; Southern Pacific, 2125 tons; New York, Chicago, Cleveland & St. Louis, 1400 tons; International-Great Northern, 200 tons; Missouri-Kansas-Texas, 100 tons; Missouri Pacific, 200 carloads; Chicago, Milwaukee, St. Paul & Pacific, 34 carloads; Mobile & Ohio, 20 carloads; Nashville, Chattanooga & St. Louis, 9 carloads.

Dealers' buying prices per gross ton, f.o.b. St. Louis district:

No. 1 heavy melting or shoveling steel	$13.00 to $13.50
No. 2 heavy melting or shoveling steel	12.00 to 12.50
No. 1 locomotive tires	14.50 to 15.00
Misc. stand.-sec. rails including frogs, switches and guards, cut apart	14.00 to 14.50
Railroad springs	15.50 to 16.00
Bundled sheets	9.50 to 10.00
No. 2 railroad wrought	13.00 to 13.50
No. 1 busheling	9.75 to 10.25
Cast iron borings and shoveling turnings	9.25 to 9.75
Iron rails	13.00 to 13.50
Rails for rolling	15.00 to 15.50
Machine shop turnings	7.25 to 7.75
Heavy turnings	9.50 to 10.00
Steel car axles	18.00 to 18.50
Iron car axles	27.00 to 27.50
Wrot. iron bars and trans.	21.50 to 22.00
No. 1 railroad wrought	13.00 to 13.50
Steel rails, less than 3 ft.	17.00 to 17.50
Steel angle bars	14.00 to 14.50
Cast iron carwheels	14.00 to 14.50
No. 1 machinery cast	15.25 to 15.75
Railroad malleable	13.50 to 14.00
No. 1 railroad cast	14.50 to 15.00
Stove plate	11.75 to 12.25
Agricult. malleable	14.00 to 14.50
Relay. rails 60 lb. and under	20.50 to 23.50
Relay. rails 70 lb. and over	26.50 to 29.00

Canada

Railroads to Place Large Rolling Stock Orders

TORONTO, ONT., Dec. 3.—Melters showed only passive interest in the Canadian pig iron market during the week. Hand-to-mouth buyers are responsible for the bulk of new business. Orders from such melters are confined to lots of one or two cars. The daily iron melt is holding up much better than was expected a short time ago. Some of the larger consumers have sufficient business to maintain present production rates well into the new year, although there is curtailment of activity in the automotive and implement industries. Canadian pig iron prices are firm.

Prices per gross ton:

Delivered Toronto	
No. 1 fdy., sil. 2.25 to 2.75	$23.60
No. 2 fdy., sil. 1.75 to 2.25	23.10
Malleable	23.60
Delivered Montreal	
No. 1 fdy., sil. 2.25 to 2.75	$25.00
No. 2 fdy., sil. 1.75 to 2.25	24.50
Malleable	25.00
Basic	23.50
Imported Iron, Montreal Warehouse	
Summerlee	$33.50
Carron	33.00

Structural Steel.—While there is still a good volume of business pending for closing before the end of the year and still other tonnages in prospect for early 1930 closing, the current demand for structural steel is dull. Orders are mostly in lots under 500 tons, and even these are less numerous than formerly. Fabricating plants are running at full time and making large deliveries on old contracts.

Railroad Equipment.—The Canadian National Railways have announced their intention of placing orders for approximately $20,000,000 worth of freight and passenger cars and locomotives for Canadian lines during 1930. Tenders have already been called for on the first lot of the equipment required, and the initial orders will run into several millions of dollars. It is also stated that the Canadian Pacific Railway is preparing to enter the market for rolling stock for 1930 requirements.

Old Material.—Both Toronto and Montreal markets have developed dullness during the past week or 10 days, with new business confined to small tonnages for spot delivery. While no forward delivery booking is being done, melters are taking regular delivery on old orders and the consumption of scrap is holding at a good level. Mills are purchasing heavy melting steel and turnings for immediate needs only. Prices are unchanged.

Dealers' buying prices:

	Per Gross Ton	
	Toronto	Montreal
Heavy melting steel	$10.00	$8.50
Rails, scrap	11.00	9.00
No. 1 wrought	10.00	12.00
Machine shop turnings	7.50	5.00
Boiler plate	7.50	6.00
Heavy axle turnings	8.00	7.50
Cast borings	7.50	5.00
Steel borings	7.50	6.50
Wrought pipe	6.00	6.00
Steel axles	15.00	20.00
Axles, wrought iron	17.00	22.00
No. 1 machinery cast	....	17.00
Stove plate	....	13.00
Standard carwheels	....	16.00
Malleable	....	13.00
	Per Net Ton	
No. 1 mach'ry cast	$16.00	....
Stove plate	12.00	....
Standard carwheels	15.00	....
Malleable scrap	14.00	....

Birmingham

Tennessee Company Books 44,200 Tons of Southern Rail Order— Plates, Shapes, Galvanized Sheets Reduced $1

BIRMINGHAM, Dec. 3.—The movement of pig iron has declined to the smallest volume in weeks. This is partly due to reduced operations by pipe shops and other foundries in the district. The amount of carryover depends upon the length of the holiday shutdowns. Several inquiries for first quarter iron have been received from district consumers. A few small tonnages for first quarter delivery to outside points have been sold at $14. Prices for the district continue on the basis of $14.50. There have been no changes in furnace operations. Nine are on foundry, six on basic and one on recarburizing iron, a total of 16.

Prices per gross ton, f.o.b. Birmingham dist. furnaces:

No. 2 fdy., 1.75 to 2.25 sil.	$14.50
No. 1 fdy., 2.25 to 2.75 sil.	15.00
Basic	14.50

Finished Steel.—The volume of incoming business is undiminished. In rails, railroad accessories, plates and bars, new business of the last two weeks of November was slightly ahead of that of the first two weeks. Declines were shown in wire and wire products, sheets and some of the lesser important lines. The Tennessee company shared in the new rail orders of the Southern Railway last week to the extent of 44,200 tons, including 11,000 tons of 130-lb. rails, 24,800 tons of 100-lb. and 8400 tons of 85 and 90-lb. Tank plates, structural shapes and galvanized sheets have been reduced $1 a ton. The former two items are now quoted at 2.05c. and the latter at 3.65c. All other prices are the same. Structural steel fabricators have several good projects in prospect for December. The Ingalls Iron Works Co. has booked 400 tons for the S. H. Kress Co. store at Durham, N. C. Reinforcing bar business is at the low point of the year. Active open-hearths total 19, one less than last week.

Cast Iron Pipe.—The American Cast Iron Pipe Co. has booked 800 tons for Los Angeles, Cal., and the McWane Cast Iron Pipe Co., 220 tons for the same city. Other sales last week were in lots less than 100 tons, and the aggregate was light. Plants here are bidding on a 6500-ton project at Detroit to be let this week and a 900-ton project at Memphis, Tenn., also to be closed this week. Richmond, Va., will open bids Dec. 5 for a fair-sized project, and St. Louis is expected to take bids within the next few weeks on several hundred tons. Demand is notably better than 10 days ago, and pressure pipe manufacturers expect continued improvement, with utilities and municipalities showing more interest in their 1930 requirements. It is estimated that operations are about 15 per cent less than they were 30 days ago. Base prices remain at $37 to $38 a net ton, Birmingham.

Old Material.—The movement of steel grades continues up to the average of the past several weeks, though it is light when compared with this time in previous seasons. Iron scrap is dull. Prices are unchanged.

Prices per gross ton, deliv'd Birmingham dist. consumers' yards:

Heavy melting steel	$13.00 to $13.50
Scrap steel rails	14.00
Short shoveling turnings	9.00
Cast iron borings	9.00
Stove plate	11.50 to 12.00
Steel axles	22.00
Iron axles	23.00
No. 1 railroad wrought	10.00 to 10.50
Rails for rolling	15.50
No. 1 cast	13.00
Tramcar wheels	12.50
Cast iron carwheels	13.00 to 13.50
Cast iron borings, chem.	13.50 to 14.00

Lewis-Shepard Co., Boston, has appointed the Lincoln Products Corporation, 31 Fulton Street, Newark, as distributers in northern New Jersey for jacklifts, arc-welded skid platforms and stackers for handling material into and out of storage.

Boston

Utility Companies to Buy 10,000 Tons of Pipe —Pig Iron Prices Unsettled

BOSTON, Dec. 3.—Pig iron buying continues small, but indications are business will be better this month. Two Buffalo district furnaces are offering No. 2X at $17 a ton, furnace, but so far have not offered No. 2 plain for less than that price. Furnaces east of Buffalo are meeting $17 a ton for No. 2X. Users of Southern iron are well covered. One Southern furnace is making low prices and foundries are using these as a lever on Northern iron prices. Recent sales included a fair tonnage of Indian iron at $21.50 to $22 a ton, duty paid, on dock here.

Foundry iron prices per gross ton deliv'd to most New England points:

*Buffalo, sil. 1.75 to 2.25	$21.91 to $22.91
*Buffalo, sil. 2.25 to 2.75	21.91 to 22.91
East. Penn., sil. 1.75 to 2.25	22.65 to 23.15
East. Penn., sil. 2.25 to 2.75	23.15 to 23.65
Va., sil. 1.75 to 2.25	25.21
Va., sil. 2.25 to 2.75	25.71
*Ala., sil. 1.75 to 2.25	24.11
*Ala., sil. 2.25 to 2.75	24.61
†Ala., sil. 1.75 to 2.25	20.25
†Ala., sil. 2.25 to 2.75	20.75

Freight rates: $4.91 all rail from Buffalo; $3.65 all rail from eastern Pennsylvania; $5.21 all rail from Virginia; $9.61 all rail from Alabama and $5.75 rail and water from Alabama to New England seaboard.

*All rail rate.

†Rail and water rate.

Cast Iron Pipe.—Activity centers in the sounding out of the market for an aggregate of 10,000 tons of pipe by five New England utility companies. Aside from the purchase of a car of 6-in. pipe and a car of 8-in. by Chelsea, Mass., from French pipe makers, no open municipal business was placed the past week. Westminster, Mass., will install a water system in 1930. Prices quoted openly on domestic pipe are: 4-in., $44.10 to $45.10 a ton, delivered common Boston freight rate points; 6 to 12-in., $40.10 to $41.10; 16 to 20-in., $39.60. A $4 differential is asked on Class A and gas pipe.

Warehouse Prices, f.o.b. Boston

	Base per Lb.
Plates	3.365c.
Structural shapes—	
Angles and beams	3.365c.
Tees	3.365c.
Zees	3.465c.
Soft steel bars, small shapes	3.265c.
Flats, hot-rolled	4.15c.
Reinforcing bars	3.265c. to 3.54c.
Iron bars—	
Refined	3.265c.
Best refined	4.60c.
Norway rounds	6.60c.
Norway squares and flats	7.10c.
Spring steel—	
Open-hearth	5.00c. to 10.00c.
Crucible	12.00c.
Tie steel	4.50c. to 4.75c.
Bands	4.015c. to 5.00c.
Hoop steel	5.50c. to 6.00c.
Cold-rolled steel—	
Rounds and hex	*3.55c. to 5.55c.
Squares and flats	*4.05c. to 7.05c.
Toe calk steel	6.00c.
Rivets, structural or boiler	4.50c.

	Per Cent Off List
Machine bolts	50 and 5
Carriage bolts	50 and 5
Lag screws	50 and 5
Hot-pressed nuts	50 and 5
Cold-punched nuts	50 and 5
Stove bolts	70 and 10

*Including quantity differentials.

Reinforcing Steel.—Aside from a sale of 500 tons for a New Haven, Conn., job, the aggregate tonnage of billet steel bars sold the past week was again small. Prospects for business are a little brighter, however, as the Maine State Highway Commission will buy 300 tons; 200 tons is wanted for a Worcester, Mass., shoe shop addition, and 125 tons for a Cambridge, Mass., hospital addition, while 200 tons for a Boston electric lighting station and 150 tons for a Providence, R. I., bridge are still pending. The trade openly quotes 2.61½c. a lb., base, from stock on large tonnages of billet steel bars, and 3.16c. on small tonnages. The open market on rail steel bars is 2.26½c. a lb., base, delivered common Boston freight rate points.

Coke.—As anticipated, New England by-product foundry coke companies made no change in their price for December deliveries. It remains at $11 a ton, delivered within a $3.10 freight rate zone. November shipments were somewhat less than those for the corresponding month last year. Domestic coke is in good demand.

Old Material.—Business in scrap for domestic consumption the past week was practically at a standstill. Prices continue to ease off, some shading being noted on T rails, heavy melting steel, steel turnings, skeleton, shafting, axles and chemical borings. Easier prices on chemical borings are attributed to the holding up of shipments by consumers. A steamer with scrap rails and miscellaneous scrap cleared this port the past week for Genoa, Italy. A boat is now loading a similar cargo for Danzig.

Buying prices per gross ton, f.o.b. Boston rate shipping points:

No. 1 heavy melting steel	$9.50 to $10.00
Scrap T rails	9.00 to 10.00
Scrap girder rails	8.50 to 9.00
No. 1 railroad wrought	10.50 to 10.75
No. 1 yard wrought	9.50 to 10.00
Machine shop turnings	5.50 to 6.00
Cast iron borings (steel works and rolling mill)	6.00 to 6.25
Bundled skeleton, long	8.25 to 8.50
Forge flashings	8.50 to 9.00
Blast furnace borings and turnings	5.50 to 6.00
Forge scrap	8.50 to 9.00
Shafting	13.50 to 14.00
Steel car axles	15.50 to 16.00
Wrought pipe 1 in. in diameter (over 2 ft. long)	9.00 to 9.50
Rails for rolling	11.00 to 11.25
Cast iron borings, chemical	8.75 to 9.00
Prices per gross ton deliv'd consumers' yards:	
Textile cast	$14.00 to $14.50
No. 1 machinery cast	15.00 to 15.25
No. 2 machinery cast	13.00 to 13.25
Stove plate	11.00 to 11.50
Railroad malleable	18.50 to 19.00

Cincinnati

Pig Iron Purchases Are Restricted to Immediate Needs—Sheet Demand About 50 Per Cent—Scrap Weak

CINCINNATI, Dec. 3.—Continued conservatism among district consumers of pig iron is restricting demand to a minimum. Purchases are small and for immediate needs. During the last week approximately 2500 tons of iron was sold, the bulk of which was in small quantities, generally carload lots, although a few orders of 100 tons or more were reported. A northern West Virginia consumer took 500 tons of Northern foundry iron and the Norfolk & Western Railroad bought 100 tons of the same grade. A Michigan consumer purchased 300 tons of charcoal iron. Price schedules on both Northern and Southern iron are being maintained, although one Southern furnace is reported to be granting concessions of 50c. The lack of inquiry either for immediate needs or for first quarter requirements reflects still further the quietness of this market and is causing some doubt as to any improvement in the near future.

Prices per gross ton, deliv'd Cincinnati:

So. Ohio fdy., sil. 1.75 to 2.25	$19.89 to $20.39
Ala. fdy., sil. 1.75 to 2.25	17.69 to 18.19
Ala. fdy., sil. 2.25 to 2.75	18.19 to 18.69
Tenn. fdy., sil. 1.75 to 2.25	17.69 to 18.19
S'th'n Ohio silvery, 8 per cent	26.89

Freight rates, $1.89 from Ironton and Jackson, Ohio; $3.69 from Birmingham.

Finished Steel.—New bookings of sheets in the past week were approximately 50 per cent of normal production, and operating schedules were at a rate about equal to the demand. Galvanized roofing material is still leading in current demand, although electrical manufacturers are taking a fair amount of sheets. With unfavorable weather holding up building projects, the demand for fabricated material is low and district fabricators are anxious for business.

Coke.—Movement of by-product foundry coke on contracts last month was approximately 20 per cent under

Warehouse Prices, f.o.b. Cincinnati

	Base per Lb.
Plates and struc. shapes	3.40c.
Bars, soft steel or iron	3.30c.
New billet reinforc. bars	3.15c.
Rail steel reinforc. bars	3.00c.
Hoops	4.05c.
Bands	3.50c.
Cold-fin. rounds and hex	3.85c.
Squares	4.35c.
Black sheets (No. 24)	4.05c.
Galvanized sheets (No. 24)	4.90c.
Blue ann'l'd sheets (No. 10)	3.45c.
Structural rivets	3.85c.
Small rivets	65 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg	2.85
Cement c't'd nails, base 100 lb. keg	2.85
Chain, per 100 lb.	8.75

	Net per 100 Ft.
Lap-weld steel boiler tubes, 2-in.	$16.50
4-in.	34.50
Seamless steel boiler tubes, 2-in.	17.50
4-in.	36.00

the level of October. Specifications so far this month are about on the same rate and, with the melt still light, oven representatives do not expect any marked improvement soon. Cold weather is stimulating the demand for domestic grades of coke.

Old Material.—Although no changes in dealers' schedules were made last week, dealers are leaning toward the bottom of price spreads in purchases. Further price recessions during the next week are anticipated. Mills are still curtailing shipments of scrap on contract, and business is small. The supply of most grades is ample.

Dealers' buying prices per gross ton, f.o.b. cars, Cincinnati:

Heavy melting steel	$12.25 to $12.75
Scrap rails for melting	13.00 to 13.50
Loose sheet clippings	8.00 to 8.50
Bundled sheets	10.75 to 11.25
Cast iron borings	8.25 to 8.75
Machine shop turnings	8.00 to 8.50
No. 1 busheling	10.00 to 10.50
No. 2 busheling	6.50 to 7.00
Rails for rolling	13.50 to 14.00
No. 1 locomotive tires	14.25 to 14.75
No. 2 railroad wrought	12.25 to 12.75
Short rails	17.50 to 18.00
Cast iron carwheels	12.50 to 13.00
No. 1 machinery cast	18.50 to 19.00
No. 1 railroad cast	15.00 to 15.50
Burnt cast	10.00 to 10.50
Stove plate	10.00 to 10.50
Brake shoes	10.00 to 10.50
Agricultural malleable	14.00 to 14.50
Railroad malleable	15.00 to 15.50

Youngstown

Valley Mills Operating at 55 to 60 Per Cent

YOUNGSTOWN, Dec. 3.—Iron and steel companies of the district, following an irregular month in November, entered December with production schedules between 55 and 60 per cent.

Both of the major independents, the Youngstown Sheet & Tube Co. and the Republic Iron & Steel Co., are maintaining this rate. The Sharon Steel Hoop Co. is operating all nine sheet mills at its Haselton plant in Youngstown, its open-hearth furnaces at Lowellville on a 50 per cent basis and its Sharon mills at 55 per cent.

Tin plate and strip capacity in this district is averaging 50 per cent, while independent bar mills and pipe mills are operating at 60 per cent. The outlook is that the industry will continue at this level for the remainder of the year. Sheet capacity in the Youngstown district is not engaged above 50 per cent. Of 51 independent open-hearth furnaces, 20 are active, while 50 of the 120 sheet mills are scheduled for partial engagement.

Japan May Buy Borneo Iron Ore

YOKOHAMA, JAPAN, Oct. 15.—An offer of iron ore from Borneo by a French company is being investigated by the Seitetsu Jo (Government Works), and the head of the Engineering Department of Kyushu Imperial University has been appointed to make a personal survey of the Borneo deposits and render a report as to the advisability of using supplies from that source.

Buffalo

Pig Iron Shipments Hold Up Well but New Buying Is Light —Steel Mill Operations Decline

BUFFALO, Dec. 3.—Although pig iron inquiry has dropped off considerably, shipments are keeping up remarkably well and producers are confident that late this month there will be a fair volume of inquiries for the first quarter. No extended buying movement is expected, however. Among current inquiries from consumers in the immediate Buffalo district is one for 400 tons of malleable; another is for 200 tons of foundry. An inquiry for 1500 to 2000 tons of foundry is expected shortly. The Y furnace of the Wickwire-Spencer Steel Co. has been blown in in place of the X furnace. The Lackawanna plant of the Bethlehem Steel Co. banked a furnace on Sunday, and now has four of its seven furnaces at that plant in operation.

Prices per gross ton, f.o.b. furnace:

No. 2 fdy., sil. 1.75 to 2.25	$19.50
No. 2X fdy., sil. 2.25 to 2.75	20.00
No. 1 fdy., sil. 2.75 to 3.25	21.00
Malleable, sil. up to 2.25	20.00
Basic	$17.50 to 18.00
Lake Superior charcoal	27.28

Finished Steel.—Operation of steel mills in this district has declined. The Lackawanna plant of the Bethlehem Steel Co. is operating at approximately 50 per cent of capacity, with 10 of its 22 open-hearths going, and mills either down entirely or on single turn. The Donner Steel Co. is operating three open-hearths about four days a week, and Seneca Iron & Steel Co. is at about 50 per cent capacity. A few small reinforcing bar jobs are being figured. The contract for school 67, which will require about 175 tons of rail steel, will be let this week. The remainder of the new City Hall reinforcing contract will be rail steel. There is almost an entire absence of structural lettings.

Old Material.—The market is very dull. No important transactions are noted. It is reported that one of the larger mills is out of the market for two months, having accumulated an exceptionally large stock pile. There appears to be a market for machine shop turnings, borings and turnings and cast iron borings, though one sizable order for cast iron borings was suspended recently. Premiums were paid in some instances for shipments of cast iron borings during November. One of the larger consumers of No. 1 machinery cast and stove plate continues to hold up shipments. The Michigan Central Railroad list closes Dec. 3, the Erie Dec. 4, and the Pennsylvania Dec. 4. The Pennsylvania list, which ordinarily includes about 10,000 tons of No. 1 heavy melting steel, will run about 2300 tons this month. Production of scrap in general has dropped off considerably.

Prices per gross ton, f.o.b. Buffalo consumers' plants:

Basic Open-Hearth Grades:	
No. 1 heavy melting steel	$14.00 to $14.50
No. 2 heavy melting steel	12.50 to 13.00
Scrap rails	15.00 to 15.50
Hydraul. comp. sheets	12.50 to 13.00
Hand bundled sheets	11.00 to 11.50
Drop forge flashings	12.50 to 13.00
No. 1 busheling	12.50 to 13.00
Hvy. steel axle turnings	13.00
Machine shop turnings	8.00 to 8.50
No. 1 railroad wrought	11.50 to 12.00
Acid Open-Hearth Grades:	
Knuckles and couplers	17.00 to 17.50
Coil and leaf springs	17.00 to 17.50
Rolled steel wheels	17.00 to 17.50
Low phos. billet and bloom ends	18.00 to 18.50
Electric Furnace Grades:	
Short shov. steel turnings	10.75 to 11.25
Blast Furnace Grades:	
Short mixed borings and turnings	10.75 to 11.25
Cast iron borings	10.75 to 11.25
No. 2 busheling	8.00
Rolling Mill Grades:	
Steel car axles	17.00 to 17.50
Iron axles	20.00 to 21.00
Cupola Grades:	
No. 1 machinery cast	14.50 to 15.00
Stove plate	12.00 to 12.25
Locomotive grate bars	11.00 to 11.50
Steel rails, 3 ft. and under	17.75 to 18.00
Cast iron carwheels	12.00 to 12.25
Malleable Grades:	
Industrial	16.50 to 17.00
Railroad	16.50 to 17.00
Agricultural	16.50 to 17.00
Special Grades:	
Chemical borings	12.50 to 13.50

Warehouse Prices, f.o.b. Buffalo

	Base per Lb.
Plates and struc. shapes	3.40c.
Soft steel bars	3.30c.
Reinforcing bars	2.95c.
Cold-fin. flats, sq. and hex.	4.45c.
Rounds	3.95c.
Cold-rolled strip steel	5.85c.
Black sheets (No. 24)	4.20c.
Galv. sheets (No. 24)	4.85c.
Blue ann'l'd sheets (No. 10)	3.50c.
Com. wire nails, base per keg	$3.60
Black wire, base per 100 lb.	3.75

Detroit Scrap Weak

DETROIT, Dec. 3.—There have been no changes in the market on old material. The market is very weak. The few sales made are on the low side of the range.

Dealers' buying prices per gross ton, f.o.b. cars, Detroit:

Hvy. melting and shov. steel	$12.00 to $13.00
Borings and short turnings	8.00 to 8.50
Long turnings	7.50 to 8.00
No. 1 machinery cast	12.50 to 13.00
Automotive cast	11.50 to 12.00
Hydraul. comp. sheets	11.75 to 12.25
Stove plate	9.00 to 9.50
New No. 1 busheling	11.00 to 11.50
Old No. 1 busheling	9.50 to 10.00
Sheet clippings	8.00 to 8.50
Flashings	10.25 to 10.75

American Electric Fusion Corporation, Chicago, has appointed the R. D. Thomas Co., Philadelphia, as agent for the company's spot, seam and tube welders.

Republic Iron & Steel Co. has leased offices in the new Lincoln Building, East Forty-second Street, for its New York headquarters. Company will move from 17 Battery Place next spring.

Railroad Equipment

Rock Island Buys 5000 Cars and Missouri Pacific 1000

WITH orders placed in the past week for almost 6700 cars and with fresh inquiries for a like amount, indications are that railroad equipment manufacturers will be busy during the winter months. The Rock Island has bought 5000 cars, the Missouri Pacific 1000 and the Chicago, Milwaukee, St. Paul & Pacific 300. The latter road also will buy 3050 cars and 30 locomotives. The Canadian National Railways are inquiring for 3225 cars. The Southern Pacific will spend $8,300,000 for new equipment, including 36 steam locomotives and 400 freight cars, while the New York, New Haven & Hartford will purchase 10 electric locomotives. Details of the week's business follow:

Chicago, Rock Island & Pacific has ordered 5000 freight cars, divided as follows: 1000 composite gondola cars to Pressed Steel Car Co.; 1000 automobile cars to Bettendorf Co.; 500 automobile cars to Standard Steel Car Co.; 1000 box cars to American Car & Foundry Co.; 500 box cars to General American Car Corporation; 500 box cars to Pullman Car & Mfg. Corporation; 250 stock cars and 250 flat cars to Ryan Car Co. This road is considering entering the market for passenger and baggage car equipment.

Missouri Pacific has ordered 1000 steel hopper cars from Standard Steel Car Co. and has 1250 box cars still to purchase.

Chicago, Milwaukee, St. Paul & Pacific has ordered 300 70-ton ore cars from Pressed Steel Car Co. This road will also buy 600 flat cars, 700 box cars, 1000 gondola cars, 750 stock cars, 15 freight locomotives and 15 passenger locomotives.

Great Northern has ordered 200 flat cars from Standard Steel Car Co.

Swift & Co., Chicago meat packers, are inquiring for 300 steel underframes for cars.

Atchison, Topeka & Santa Fe has ordered 100 tank cars from General American Tank Car Corporation.

New York, New Haven & Hartford has appropriated $3,500,000 to finance the purchase of 10 electric locomotives and 35 multiple-unit passenger cars and trailers.

Southern Pacific will expend $8,300,000 for new equipment to include 35 steam locomotives, two electric locomotives, 47 units of passenger train equipment, 400 freight cars, also cranes, ditchers and steam shovels. Company will build 60 caboose cars and 20 locomotive tenders in its own shops.

Canadian National Railways are inquiring for 3000 box, 200 refrigerator and 25 tank cars.

St. Louis-San Francisco has ordered 10 baggage-mail cars from American Car & Foundry Co.

St. Louis Southwestern will buy 10 4-8-4 type locomotives.

Chicago & North Western will buy one derrick car.

Otis Steel Contracts For Continuous Sheet Process

The Otis Steel Co., Cleveland, is planning for the erection of a continuous rolling mill for the manufacture of sheets and strip steel under the process controlled by the American Rolling Mill Co., Middletown, Ohio. The board of directors of the Otis company has authorized the closing of a contract with the Middletown company to use the latter company's rolling process.

Details of the plant extensions and equipment have not been worked out, but the Otis company plans to start on the construction work early in the year. The erection of plant additions and the new rolling equipment will involve an expenditure of $10,000,000, according to an announcement of E. J. Kulas, president of the Otis company.

Strong Aluminum Alloys for Warships

Since the weight of warships has been restricted to 10,000 tons displacement by the Limitation of Armament Conference, the weight-saving possibilities of aluminum have been of special interest to the United States Navy, says a recent bulletin issued by the Navy Department, Bureau of Engineering.

"Duralumin is a striking alloy," the bulletin continues. "In the wrought condition and when properly heat-treated it has the properties of structural steel with about one-third the weight." Acetylene welding of duralumin at the naval aircraft factory, at Philadelphia, has been developed to a satisfactory state. General methods of welding and of riveting duralumin sheet are also outlined in the bulletin.

Production, Shipments and Consumption

	October, 1929	September, 1929	October, 1928
Steel furniture shipments(a)	$2,971,004(b)	$2,333,984	$3,158,998
do., do., ten months	28,395,643	.....	29,071,961(c)
do., new orders(a)	2,855,588	2,290,133	3,192,927
do., unfilled orders(d)	2,067,212	2,055,457	2,095,139
Steel shelving shipments(a)	979,236	842,635	953,804
do., do., ten months	9,606,302(c)	.....	7,590,062
Electric power production(e)	8,685,131(c)	8,059,874	.....
Whereof, by water-power	2,724,872	2,471,369	.....
Coking coal consumed at by-product plants, net tons(f)	6,658,006	.....	6,098,028

(a)United States Department of Commerce. (b)Largest since last February. (c)Largest on record. (d)End of month. (e)United States Geological Survey; quantities are in thousands of kwhr. and represent output of public utility plants. (f)United States Bureau of Mines.

Reinforcing Steel

Awards Total 1400 Tons and Inquiries 3500 Tons

CONTRACTS for reinforcing steel in the past week totaled only 1400 tons. Inquiries appeared for 3500 tons, of which 1000 tons is for a freight terminal and warehouse at Hoboken, N. J. Awards follow:

NEW HAVEN, CONN., 500 tons, incinerator plant, to an unnamed fabricator.

CAMDEN, N. J., 125 tons, underpass at approach to Delaware River bridge, to Truscon Steel Co.

CLEVELAND, 110 tons, footings for National Town and Country Club, to Bourne-Fuller Co.

EAST MOLINE, ILL., 100 tons, school, to Laclede Steel Co.

ST. LOUIS, 100 tons, Coca-Cola bottling plant, to Laclede Steel Co.

ST. LOUIS, 100 tons, addition to Melbourne Hotel, to Missouri Rolling Mill Corporation.

OAKLAND, CAL., 350 tons, Sears, Roebuck & Co. building, to Soule Steel Co.

Reinforcing Bars Pending

Inquiries for reinforcing steel bars include the following:

AUGUSTA, ME., 300 tons for State Highway Commission.

WORCESTER, MASS., 200 tons, shoe plant addition.

CAMBRIDGE, MASS., 125 tons, hospital addition.

NEW YORK, 225 tons, power house at Hunter College.

CALDWELL, N. J., 240 tons, St. Dominick's Academy.

HOBOKEN, N. J., 1000 tons, additional unit for Pennsylvania Terminal & Warehouse Co.

NEWARK, N. J., 600 tons, warehouse for Lehigh Valley Transportation Co.

BUFFALO, 175 tons, rail steel for school No. 67.

LIMA, OHIO, 100 tons, depot.

CHICAGO, 200 tons, public school.

CHICAGO, tonnage being estimated, Chicago Yacht Club building in Grant Park.

CHICAGO, tonnage not stated, hotel at Wabash Avenue and Harrison Street.

SEATTLE, 200 tons, Fourteenth Avenue South bridge; general contract to Puget Sound Bridge & Dredging Co.

SACRAMENTO, CAL., 306 tons, highway work in Los Angeles County; bids Dec. 18.

Foundrymen's Non-Ferrous Shop Operation Course

A non-ferrous shop operation course for brass foundrymen, along the lines given in recent years for gray iron foundrymen, is part of the program for the next convention of the American Foundrymen's Association in Cleveland the week of May 12, 1930. The subjects to be dealt with will include crucible, open fire, and electric furnace melting practice, as well as the subject of gating and the effect of pouring temperatures and pouring practice. The course will be held at 4 p. m. during the days of the convention and each subject will be in charge of a leader who is an authority in each particular field. The chairman of the course is W. F. Graham, Ohio Brass Co., Mansfield, Ohio.

Distributing Employment at Youngstown

Part Time to Operating Men, While Extensive Repair Work Aids Others

STEEL companies at Youngstown are making every possible effort to distribute employment among as large a number of men as is feasible. In a period of restrained buying and operations, such as now exists, millwrights, electricians and repair crews are kept busy putting equipment in readiness for broader operations later on. This is requiring extra work at present because of the heavy strain upon rolling mills during the first eight months of the year.

Workers engaged in actual production are also provided for as much as possible. Where a mill operates only one shift, workers on all three shifts are given equal time. For example, on a rolling mill operating only the day shift, workers on the other two shifts divide the time with the day men. Thus, in a six-day week, each receives employment two days a week, whereas the day shift worker would receive six days' work and the men on the other shifts none, unless such a plan were used. Department heads and foremen in the plants are advised to distribute work so that the largest number of men benefit.

Frank Purnell President of Sheet and Tube Company

Directors of the Youngstown Sheet & Tube Co. on Tuesday elected Frank Purnell president, succeeding James A. Campbell, who becomes a chairman of the board, a newly created position. Since Jan. 1, 1927, Mr. Purnell has been assistant president and during the last few years has gradually assumed many of the responsibilities which formerly devolved upon Mr. Campbell. The changes become effective Jan. 1, 1930.

FRANK PURNELL

The directors also appropriated $2,000,000 for modernizations and replacements, chiefly in the Youngstown district, these sums to be expended in 1930. Regular dividends were declared.

Mr. Campbell, as chairman of the board, will continue to have general direction of the affairs of the company. Mr. Purnell is now 43 years of age and is one of the youngest steel company executives in the country. In 1902 he began his career in the industry, starting as a hall boy for the Sheet & Tube company. In August, 1917, he was "loaned" to the War Industries Board, and in 1919 became vice-president of the Consolidated Steel Corporation, New York, export representative of independent steel companies. In 1922 he was made vice-president of the Bethlehem Steel Corporation, in charge of its export department. He returned to the Sheet & Tube organization in September, 1923, as a vice-president, and on Jan. 1, 1927, was made assistant president.

Address Heat Treaters on Economics

"Economics of Heat Treating" will be the subject of Robert M. Keeney at the meeting of the New York Chapter of the American Society for Steel Treating, Monday evening, Dec. 9. Mr. Keeney is connected with the Connecticut Light & Power Co., Hartford and he has made a broad study of the application of various kinds of fuel besides electricity in the heat treatment of ferrous and non-ferrous products. The meeting will be held in the club rooms of the Building Trades Employers' Association, 2 Park Avenue, New York, and will be preceded by a dinner at the same place at 6.30.

The January meeting of the chapter will be held on Monday evening, Jan. 13, at which Dr. H. W. Gillett, director Battelle Memorial Institute, Columbus, Ohio, will be the speaker.

Steel Treaters Hear More About Nitriding

Nitriding, the new art of surface hardening of steel, featured the November meetings of three chapters of the American Society for Steel Treating. On Nov. 22 members of the Philadelphia, St. Louis and Washington-Baltimore Chapters met in separate meetings to learn more about nitriding from experts on the subject.

In Philadelphia, V. T. Malcolm of the Chapman Valve Mfg. Co., Indian Orchard, Mass., explained the commercial application of nitriding, in which he has gained considerable experience. Also on the Philadelphia program was John Hirsch, research metallurgist, Leeds & Northrup Co., Philadelphia. Mr. Hirsch's talk on "Controlling the Nitriding Operation," described the furnace mechanism which the speaker had adapted for the nitriding process.

Robert Sergeson, metallurgist with the Central Alloy Steel Corporation, Canton, Ohio, was the featured speaker at the St. Louis meeting. In a talk, illustrated with slides, Mr. Sergeson gave a survey of the accomplishments in the nitriding of steel and described the process.

Members of the Washington-Baltimore chapter met in Baltimore to hear Dr. Victor O. Homerberg, professor of metallurgy, Massachusetts Institute of Technology. Dr. Homerberg gave special emphasis to the practical aspects and use of nitriding.

Philadelphia Metal Jobbers to Merge Dec. 31

Carter, Donlevy & Co., Gummey, McFarland & Co., and Riter Brothers & Co., wholesale sheet metal distributers of Philadelphia, will be succeeded on Dec. 31 by a new organization to be known as the Eastern Metals Corporation.

The new company will be located in a commodious warehouse at 1736 to 1746 Frankford Avenue, with railroad siding, and all modern facilities. Large and diversified stocks of tin plate, metals, tools, machines and supplies will be carried.

Tin Plate Company Bought By Corrigan-McKinney

The N. & G. Taylor Co., Philadelphia, one of the oldest makers of tin plate in the United States, has been acquired by the Corrigan-McKinney Steel Co., Cleveland. For the past year and a half, William McLean, president, N. & G. Taylor Co., has been in charge, operating it for the creditors. Under the terms of the sale, the Corrigan-McKinney company will pay $300,000 for the plant and other assets and will incorporate a new company with the same name, which will issue 3000 shares of first preferred stock and 3250 shares of second preferred stock of $100 par value and 3500 shares of common stock of no par value. The stock and cash will be used to pay the obligations of the company.

The Taylor company has been in business since 1810, and until a year and a half ago, when financial difficulties were encountered, operated its main plant at Cumberland, Md., and a small plant in Philadelphia. At that time the Philadelphia plant was dismantled and removed to Cumberland, bringing the annual capacity of that mill to about 710,000 base boxes of tin plate. Present officers of the N. & G. Taylor Co. are William McLean, president, and J. H. Krupp, secretary and treasurer. Incorporation of the new company has not yet been completed.

Non-Ferrous Metal Markets

Copper Steady at 18c. But Buyers Wait for Concessions —Tin Dull—Zinc Price Down

NEW YORK, Dec. 3.

Copper.—Little has occurred in the past week to encourage producers. Buyers, especially in the foreign market, are continuing to press for a reduction in prices, but there is no indication that any substantial amount of electrolytic copper is available under 18c., delivered in the Connecticut Valley. In fact, the comparatively small tonnages which were offered at concessions in the past two weeks have been contracted for by those customers who were persistently hunting bargain lots and little, if any, material can now be obtained at less than 18c. However, the report has spread that after Jan. 1 the price will be cut by the large producers and consequently copper users are holding off making purchases until they see what happens. It is not surprising, under the circumstances, that sales have been meager and have consisted solely of small lots for delivery this month. Producers disclaim knowledge of a contemplated drop in quotations and declare that they can sell just as much copper at 18c. as at a lesser figure. The abstinence from buying on the part of foreign users is thought to have diminished their stocks almost to the vanishing point, so that they soon will be forced to place orders to cover immediate requirements. A comparable situation, however, does not exist in the domestic trade, because most customers have considerable material on hand and can well afford to await developments before making future commitments. November statistics are expected to show an increase in refined stocks, and this will tend to further weaken the position of producers. Curtailment of output, designed chiefly to correct the over-balance of supply as against demand, has been started, but probably will not be reflected in the monthly figures until January. Copper Exporters, Inc., is still quoting 18.30c., c.i.f. usual European ports. Orders for Lake copper have been light, with quotations steady at 18c. to 18.12½c., delivered.

Copper Averages.—The average price of Lake copper for November, based on daily quotations in THE IRON AGE, is 18.12½c., delivered New York. The average price of electrolytic copper is 17.75c., refinery, or 18c., delivered in the Connecticut Valley.

Tin.—With total sales scarcely ex-

THE WEEK'S PRICES. CENTS PER POUND FOR EARLY DELIVERY

	Dec. 3	Dec. 2	Nov. 30	Nov. 29	Nov. 27
Lake copper, New York	18.12½	18.12½	18.12½	18.12½	18.12½
Electrolytic copper, N. Y.*	17.75	17.75	17.75	17.75	17.75
Straits tin, spot, N. Y.	39.37½	38.75	39.75	39.75	40.37½
Zinc, East St. Louis	6.00	6.00	6.00	6.15	6.15
Zinc, New York	6.35	6.35	6.35	6.50	6.50
Lead, St. Louis	6.10	6.10	6.10	6.10	6.10
Lead, New York	6.25	6.25	6.25	6.25	6.25

*Refinery quotation; price ¼c. higher delivered in the Connecticut Valley.

Rolled Products
List Prices, Per Lb., f.o.b. Mill

On Copper and Brass Products, Freight up to 75c. per 100 Lb. Allowed on Shipments of 500 Lb. or Over.

Sheets—
- High brass ..... 23.25c.
- Copper, hot rolled ..... 26.75c.
- Zinc ..... 10.50c.
- Lead (full sheets) ..... 10.25c.

Seamless Tubes—
- High brass ..... 28.25c.
- Copper ..... 29.25c.

Rods—
- High brass ..... 21.25c.
- Naval brass ..... 24.00c.

Wire—
- Copper ..... 19.87½c.
- High brass ..... 23.75c.

Copper in Rolls ..... 26.75c.
Brazed Brass Tubing ..... 30.87½c.

Aluminum Products in Ton Lots

The carload freight rate is allowed to destinations east of Mississippi River and also to St. Louis on shipments to points west of that river.

- Sheets, 0 to 10 gage, 3 to 30 in. wide ..... 33.00c.
- Tubes, base ..... 42.00c.
- Machine rods ..... 34.00c.

Chicago Warehouse

(Prices Cover Trucking to Customers' Doors in City Limits)

	Base per Lb.
Sheets—	
High brass	23.25c.
Copper, hot rolled	27.75c.
Copper, cold rolled, 14 oz. and heavier	30.00c.
Zinc	10.75c.
Lead, wide	10.30c.
Seamless Tubes—	
Brass	28.25c.
Copper	29.25c.
Brass Rods	21.25c.
Brazed Brass Tubes	31.00c.

New York or Cleveland Warehouse

Delivered Prices, Base per Lb.

High brass	21.12½c.	to 22.12½c.
Copper, hot rolled, base sizes	27.75c.	to 28.75c.
Copper, cold rolled, 14 oz. and heavier, base sizes	30.00c.	to 31.00c.
Seamless Tubes—		
Brass	26.00c.	to 27.00c.
Copper	29.12½c.	to 30.12½c.
Brass Rods	18.87½c.	to 19.87½c.
Brazed Brass Tubes	29.12½c.	to 30.12½c.

New York Warehouse

Delivered Prices, Base Per Lb.

- *Zinc sheets (No. 9), casks* ..... 10.75c. to 11.25c.
- *Zinc sheets, open* ..... 11.50c. to 12.00c.

Metals from New York Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	41.50c. to 42.50c.
Tin, bar	43.50c. to 44.50c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	19.00c.
Zinc, slab	7.00c. to 7.50c.
Lead, American pig	7.00c. to 7.50c.
Lead, bar	9.00c. to 9.50c.
Antimony, Asiatic	10.50c. to 11.00c.
Aluminum No. 1 ingots for remelting (guaranteed over 99% pure)	25.00c. to 26.00c.
Alum. ingots, No. 12 alloy	24.00c. to 25.00c.
Babbitt metal, commercial grade	25.00c. to 35.00c.
Solder, ½ and ½	27.50c. to 28.00c.

Metals from Cleveland Warehouse

Delivered Prices, Per Lb.

Tin, Straits pig	45.50c.
Tin, bar	47.50c.
Copper, Lake	19.50c.
Copper, electrolytic	19.25c.
Copper, casting	18.75c.
Zinc, slab	8.00c. to 8.25c.
Lead, American pig	7.00c. to 7.20c.
Lead, bar	9.25c.
Antimony, Asiatic	16.00c.
Babbitt metal, medium grade	18.00c.
Babbitt metal, high grade	48.00c.
Solder, ½ and ½	29.50c.

Old Metals, Per Lb., New York

Buying prices represent what large dealers are paying for miscellaneous lots from smaller accumulators and selling prices are those charged consumers after the metal has been properly prepared for their uses.

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	14.75c.	16.00c.
Copper, hvy. and wire	14.50c.	15.50c.
Copper, light and bottoms	12.50c.	13.50c.
Brass, heavy	8.00c.	9.00c.
Brass, light	6.75c.	7.75c.
Hvy. machine composition	11.25c.	12.25c.
No. 1 yel. brass turnings	9.00c.	9.50c.
No. 1 red brass or compos. turnings	10.50c.	11.75c.
Lead, heavy	4.75c.	5.25c.
Lead, tea	3.75c.	4.25c.
Zinc	3.25c.	3.75c.
Sheet aluminum	12.00c.	13.50c.
Cast aluminum	11.00c.	13.00c.

ceeding 700 tons, the Straits tin market has been exceptionally quiet in the past week. Buying has been mostly for delivery during the next three months, although a small amount of material is for March and April shipment. The London market has been very erratic, with wide swings in prices. For example, on Nov. 28 (Thanksgiving Day, when the New York market was closed) spot standard was £176 10s., future standard £179 10s. and spot Straits £180 10s. The following day the price advanced £3 5s. and on Dec. 2 dropped back £5 10s. Today there was another recovery, with spot standard at £177 15s., future standard at £180 15s. and spot Straits at £181 15s. The Singapore schedule today was £178 15s. Spot Straits tin at New York declined steadily during the past week until today it turned slightly upward to 39.37½c., New York. The reason that the London market broke yesterday was the announcement of the estimate of Straits tin shipments of 11,000 tons in December with 14,000 tons available. This is in addition to shipments of 10,174 tons in November, making altogether a large tonnage of tin to be absorbed by consumers. Usually at this time of the year, when tin plate prices are made public for the first half of the following year, there is good buying of tin, but the volume of purchases has been far below that of previous years. Dealers surmise that tin plate manufacturers have either liberal stocks on hand or are postponing placing orders to ascertain the trend of business.

Lead.—The market has been fairly active, with users ordering small quantities for delivery in December. In a few instances, business is being booked for January, but some sellers are refusing to make contracts for shipment after Dec. 31. Prices are firm at 6.10c., St. Louis. The leading interest is adhering to its contract quotation of 6.25c., New York.

Zinc.—Zinc prices broke the past week, dropping from 6.25c., East St. Louis, to 6.15c. and later to 6c. At times quotations dipped to 5.95c. and some orders were taken at that price. However, most of the tonnage available under 6c. has been sold and the market is becoming stabilized at 6c., East St. Louis, or 6.35c., New York. Buyers have manifested only slight interest, preferring to order small lots to meet immediate needs.

Antimony.—Quietness prevails in antimony. Chinese metal for spot and future delivery is 8.62½c., New York, duty paid, the same as a week ago.

Nickel.—Ingot nickel in wholesale lots is quoted at 35c. a lb., shot nickel at 36c. and electrolytic nickel in cathodes at 35c.

Aluminum.—Virgin metal, 98 to 99 per cent pure, is selling at 23.90c. a lb., delivered.

Non-Ferrous Metals at Chicago

CHICAGO, Nov. 26.—Prices of copper, lead and antimony are holding steady in a quiet market. Quotations for tin are 3c. a lb. lower than a week ago and zinc prices also are off. The old metal market is dull.

Prices per lb., in carload lots: Lake copper, 18.50c.; tin, 39.75c.; lead, 6.10c.; zinc, 6.10c.; in less-than-carload lots, antimony, 9.50c. On old metals we quote copper wire, crucible shapes and copper clips, 14c.; copper bottoms, 11.50c.; red brass, 11.50c.; yellow brass, 8c.; lead pipe, 4.50c.; zinc, 3c.; pewter, No. 1, 24.50c.; tin foil, 22c.; block tin, 32c.; aluminum, 12.87½c.; all being dealers' prices for less-than-carload lots.

Fabricated Structural Steel

Awards, at 12,000 Tons, Are Lowest of Year—Chicago Post Office Will Require 25,000 Tons

THE total volume of fabricated structural steel awards in the past week was the lowest of the year, amounting to 12,000 tons. Most of the lettings consisted of small jobs ranging from 100 to 500 tons each. Of the 47,000 tons of new work which came out during the week, over 29,000 tons will be required for three projects in Chicago. The new Chicago post office will take 25,000 tons. Awards follow:

BOSTON & MAINE RAILROAD, 1000 tons, bridge at Windsor, Vt., to American Bridge Co.

PROVIDENCE, R. I., 250 tons, United States Rubber Co. vulcanizing plant, to J. H. Tower Iron Works, Providence.

NEW YORK, 950 tons, public school No. 102 in Bronx, to Easton Structural Steel Co.

NEW YORK, 1425 tons, apartment at Eighty-sixth Street and Madison Avenue, to Hay Foundry & Iron Works.

BROOKLYN, 300 tons, Kings County Bank, to George A. Just Co.

NEWARK, N. J., 1800 tons, garage, to American Bridge Co.

JERSEY CITY, 370 tons, Pennsylvania Terminal warehouse, to Bethlehem Steel Co.

SOUTHERN RAILWAY, 500 tons, Savannah River bridge, to Virginia Bridge & Iron Co.

DURHAM, N. C., 400 tons, S. H. Kress Co. store, to Ingalls Iron Works.

PITTSBURGH, 200 tons, addition to Boulevard of Allies, to Guibert Steel Co.

DETROIT, 200 tons, Richard School, to Guibert Steel Co.

CLEVELAND, 700 tons, Kinsman Road bridge for Nickel Plate Railroad, to McClintic-Marshall Co.

CLEVELAND, 100 tons, Dudley Blossom swimming pool, to Wheeling Structural Steel Co.

CHICAGO, BURLINGTON & QUINCY, 600 tons, divided between American Bridge Co. and Paxton & Vierling Steel Works, Omaha.

WHEATLAND, WYO., 300 tons, sugar refinery, to Midwest Steel & Iron Works Co., Denver.

GOSHEN, IND., 100 tons, factory for Chase Bag Co., New York, to Austin Co.

KEWAUNEE, WIS., 500 tons, highway bridge, to Milwaukee Bridge Co.

SEATTLE, WASH., 370 tons plates, Cedar River pipe line No. 2, to Beall Tank & Pipe Co.

BAKERSFIELD, CAL., 300 tons plates, one 85,000-bbl. tank for Petroleum Securities Co., to unnamed bidder.

OAKLAND, CAL., 100 tons, skating rink, to Judson-Pacific Co.

SACRAMENTO, CAL., 273 tons, crossing at California Park, to Dyer Brothers.

LOS ANGELES, 500 tons, plant for Pacific Iron & Steel Co., company to do its own fabricating.

LOS ANGELES, 430 tons, freight depot, Union Pacific Railroad Co., to Minneapolis Moline Power Implement Co.

PHOENIX, ARIZ., 172 tons, bridges on Holbrook-Lupton highway, to Kansas City Structural Steel Co.

WILMINGTON, CAL., 110 tons, condenser supports for Texaco, to Pacific Iron & Steel Co.

Structural Projects Pending

Inquiries for fabricated steel work include the following:

NEW YORK, 1000 tons, Central Hanover Bank & Trust Co. building on Greenwich Street.

NEW YORK, 1500 tons, apartment building on West Sixty-sixth Street.

LANCASTER, PA., 500 tons, telephone exchange building; Central Construction Co., Harrisburg, Pa., general contractor.

RICHMOND, VA., 2500 tons, building for American Tobacco Co.; Wise-Granite Co., Richmond, general contractor.

PHILADELPHIA, 2600 tons, Eighth Street subway from Ridge Avenue to Walnut Street.

STATE OF NEW YORK, 500 tons, bridges for State highway department; bids taken Dec. 6.

EASTON, PA., 750 tons, building for Lehigh Telephone Co., John N. Gill, Philadelphia, general contractor.

PARKERSBURG, W. VA., 1000 tons, building for Viscose Co.

TOLEDO, OHIO, 1000 tons, building for Toledo University.

ROCK ISLAND, ILL., 1300 tons, 20 barges; bids being taken by United States Engineer, Rock Island.

SPRINGFIELD, ILL., 300 tons, addition to Monarch Tractor plant of Allis-Chalmers Mfg. Co.

CHICAGO, 25,000 tons, post office.

CHICAGO, 2500 tons, Wabash Avenue bridge.

CHICAGO, 1800 tons, Chicago Yacht Club building in Grant Park.

DENNISON, TEX., 950 tons, highway bridge; L. E. Meyer Construction Co., low bidder on general contract.

TERRAL, OKLA., 1150 tons, highway bridge; L. E. Meyer Construction Co., low bidder on general contract.

THACKERVILLE, OKLA., 1150 tons, highway bridge; L. E. Meyer Construction Co., low bidder on general contract.

SEATTLE, 1000 tons, Fourteenth Avenue South bridge; general contract to Puget Sound Bridge & Dredging Co.

LONG BEACH, CAL., 400 tons sheet piling; Steel, Inc., low bidder.

Rustless Iron Plant To Be Built at Pittsburgh

The Rustless Iron Corporation of America, Inc., Baltimore, has engaged Perin & Marshall, 11 West Forty-second Street, New York, consulting engineers, to prepare plans for a new mill in the vicinity of Pittsburgh.

PERSONAL

CHARLES M. SCHWAB, chairman of the board of directors of the Bethlehem Steel Corporation, will be the principal speaker at the annual banquet of the Indiana Manufacturers' Association, Dec. 16, at the Columbia Club, Indianapolis.

—

HAROLD D. NORTH, vice-president and sales manager, Ferry Cap & Set Screw Co., Cleveland, has developed an international business in the manufacture of a projection screen for motion pictures which utilizes as the base an aluminum sheet.

—

R. W. HEFFNER has been elected vice-president in charge of operations of the Alan Wood Mining Co., not R. S. Poister, as stated in the Nov. 28 issue of THE IRON AGE.

—

E. W. PAGE, Victor X-Ray Corporation, Chicago, will address the Milwaukee chapter of the American Society for Steel Treating, Dec. 13, at Hotel Pfister, on "X-Ray Investigations."

—

B. D. QUARRIE, president, Oliver Iron & Steel Co., Pittsburgh, will act as toastmaster at a dinner and reception to be given at the Winton Hotel, Cleveland, Dec. 16, for Dr. WILLIAM E. WICKENDEN, new president Case School of Applied Science. Dr. Wickenden will speak on training engineers for positions of responsibility. The meeting will be held jointly by the Cleveland Engineering Society and the Cleveland section American Society of Mechanical Engineers.

—

T. M. GIRDLER, formerly president Jones & Laughlin Steel Corporation, Pittsburgh, and now associated with the Mather-Eaton steel interests in Cleveland, has been elected a director of the Union Trust Co. of that city.

—

CHARLES STOLPER, president and treasurer, Stolper Steel Products Co., Milwaukee, manufacturer of sheet steel automotive parts, has relinquished all of his interest in the Charles Stolper Cooperage Co., to devote his time to the steel products lines, which comprise gasoline tanks, fenders, and similar parts.

—

R. SERGESON, metallurgist, Central Alloy Steel Corporation, Massillon, Ohio, addressed the Milwaukee section of the Society of Automotive Engineers, Dec. 4, on nitriding and other methods of hardening steel.

—

HUGH AIKMAN of J. H. Williams & Co., Buffalo, will address the Cincinnati chapter of the American Society for Steel Treating, Dec. 5, on "Drop Forging Methods and Equipment."

—

J. E. FLETCHER, who has had a long experience with the Northern Engineering Works, Detroit, has been appointed manager of the newly established Philadelphia office of the company.

—

C. E. PIOCH, formerly general master mechanic of the Chrysler Motor Corporation, has joined the staff of the Seneca Falls Machine Co., Seneca Falls, N. Y.

—

JAMES A. MEACHAM, for the past three years specification engineer for the H. K. Ferguson Co., Cleveland, has been made engineer in charge of inspection and research.

—

J. T. MACKENZIE, metallurgist, American Cast Iron Pipe Co., Birmingham, was the principal speaker at the December meeting of the Quad-City Foundrymen's Association, held at the Chamber of Commerce, Davenport, Iowa, Dec. 2. Foundry practice was the subject of his address.

—

HARRY R. NELSON, who has been associated with the Charles L. Anderson Machinery Co., Chicago, for the past 16 years, has joined the staff of the Tool Equipment Sales Co., Chicago, as mechanical engineer.

—

GEORGE W. DRIVER, heretofore assistant manager of the malleable plant at Buffalo of the American Radiator Co., has been promoted to the managership of the company's malleable and steel plants at Buffalo.

—

WILLIAM HAGUE of the Arter Grinding Co., Worcester, Mass., spoke on "European Steel Plants and Allied Industries," Dec. 4, at a meeting of the Worcester chapter of the American Society for Steel Treating.

Floyd K. Smith Elected Head of Donner Steel Co.

Floyd K. Smith, former vice-president and treasurer of the Donner Steel Co., has been elected president, succeeding William H. Donner, who recently resigned. Mr. Smith, who was born at Bayonne, N. J., studied at Cornell University and entered the steel business with the Buhl Steel Co. of Ohio. He became sales manager of the Buhl company and went from there to the Republic Iron & Steel Co. as a district sales manager. He later became a partner in Banning, Cooper & Co., Pittsburgh, brokers, and in 1910 acquired an interest in the Valley Mold & Iron Co., Sharpsville, Pa. He remained there until 1917, when he went with the Donner Steel Co. as vice-president and treasurer.

F. K. SMITH

W. W. HANCOCK

W. W. Hancock, secretary and director of the Donner Steel Co., has been elected vice-president. Mr. Hancock attended the University of Michigan and was later associated with William H. Donner at Donora, Pa. From 1912 to 1916 he was with the Cambria Steel Co. and in 1916 became a director and secretary of the Donner Steel Co. His duties included supervision of the iron ore department. During the war he was in the flying service as a flight lieutenant and instructor.

P. F. Boyer, comptroller of the Donner Steel Co., has been named treasurer, assuming the duties of this position along with the comptrollership. Mr. Boyer entered the steel business with the American Bridge Co. in 1907 and remained there until 1916, when he became associated with the Donner Steel Co.

The Danly Machine Specialties Co., 2104 South Fifty-second Avenue, Chicago, has been appointed by the Kinite Corporation, Milwaukee, as selling representative for the Chicago district, which includes Illinois, Missouri, upper Indiana and Iowa. The Danly Machine Specialties Co. will handle the sales of Kinite cast-to-shape dies as well as Kinite bar stock.

OBITUARY

CHARLES F. BLUE, JR., for a number of years vice-president of the Carbon Steel Co., Pittsburgh, and during the dissolution of that company in 1923 its head, died at his home in Oakmont, Pa., Nov. 26. Prior to joining the Carbon Steel Co. in 1916, Mr. Blue had been associated with the Crucible Steel Co. of America as manager of its Detroit office. With the completion of the dissolution of the Carbon Steel Co., he became associated with the Pittsburgh Iron & Steel Foundries Co. as vice-president and plant manager.

—

ERIC WOLFF, designer of power and pumping plants and sales engineer with the Allis-Chalmers Mfg. Co., Milwaukee, for 17 years, and previously an engineer with the Minneapolis Steel & Machinery Co., Minneapolis, died in Milwaukee, Nov. 24, as a result of heart trouble, aged 63 years. He was born in Sweden and had engaged in engineering work since his arrival in the United States 30 years ago.

PETER C. QUACKENBUSH, president, Quackenbush & Son, Inc., dealer in iron and steel and heavy hardware, Paterson, N. J., died at his home in that city on Nov. 28, following a long illness, aged 61 years.

—

FREDERICK G. LYNN, general superintendent of the Wood Newspaper Machinery Corporation, Plainfield, N. J., died on Oct. 29. He had also been general superintendent of the Plainfield plant of the Niles, Bement, Pond Co. for many years.

—

JAMES W. MOFFAT, Canadian metallurgist, died at his home in Toronto, on Oct. 28, aged 69 years. At the time of his death he was engaged in research on a process which would be suitable for smelting Ontario ores.

—

J. H. HOLLINGER, representative in Philadelphia of the Landis Tool Co., Waynesboro, Pa., died Nov. 18, aged 61 years. He had been connected with the Landis company for 32 years, most of the time at the plant in Waynesboro.

Confidence Restored Says President

(*Concluded from page* 1531)

dent Hoover explained. "Over 6400 planes are in commercial use, and 9400 pilots are licensed by the Government. Our manufacturing capacity has risen to 7500 planes per annum. The aviation companies have increased regular air transportation until it now totals 90,000 miles per day—one-fourth of which is flown by night. Mail and express services for passenger transportation to our principal cities, and extensive services for passenger transportation have been inaugurated, and others of importance are imminent. American air lines now reach into Canada and Mexico, to Cuba, Porto Rico, Central America, and most of the important countries of South America."

Stimulation of Shipbuilding

Construction loans for the building of ships have been made by the Shipping Board to the amount of approximately $75,000,000 out of the revolving fund authorized by Congress, the President said, and have furnished an additional aid to American shipping and further stimulated the building of vessels in American yards. It was stated that the Interdepartmental Committee on the Merchant Marine in its studies of ocean mail contracts found that they have aggregated 25 awards imposing a governmental obligation of a little over $12,000,000 per annum. Provision had been made in five of the contracts for construction of new vessels to replace and expand services. These requirements, the President said, come to a total of 12 vessels in the 10-year period, aggregating 122,000 tons. The committee at this time, it was pointed out, is recommending the advertising of 14 additional routes, making substantial requirements for the construction of new vessels during the life of each contract recommended. A total of 40 new vessels will be required, the President said, under the contracts proposed, about half of which will be required to be built during the next three years. The capital cost of this new construction, the President informed Congress, will be approximately $250,000,000, involving approximately 460,000 gross tons. Should bidders be found who will make these undertakings, the President said, it will be necessary to recommend to Congress an increase in the authorized expenditure by the Post Office of about $5,500,000 annually. It will be most advantageous, the President declared, to grant such authority.

An inspection trip to the Lorain plant of the National Tube Co. will be made Dec. 7 by members of the Cleveland Engineering Society and the Cleveland section, Association of Iron and Steel Electrical Engineers, this trip having been arranged jointly by the two organizations.

FitzGerald Laboratories Transferred to Canada

The FitzGerald Laboratories of Niagara Falls, N. Y., are to be transferred to Sault Ste. Marie, Ontario, Canada, as a result of an arrangement reached between Robert Turnbull, of Toronto, and J. A. McPhail, vice-president, Great Lakes Power Co. Work will be started at once on the erection of a building next to that of the Superior Alloys, Ltd., in which Mr. Turnbull is also interested. It will be ready for operation within a few months.

One of the most important problems to be tackled by the laboratory will be the making of the final tests in connection with the Turnbull process for the reduction of iron ore to sponge iron, which it is expected will make the low-grade iron ores of this province commercially available. For this purpose a furnace of semi-commercial size will be built in connection with the laboratories and the tests will be taken up at the point where they were interrupted by the recent death of F. A. J. FitzGerald, director of the laboratory and associate of Mr. Turnbull in several electrometallurgical enterprises. The new furnace will be utilized to work out refinements in the process, gather additional data as to costs, and so on. Algoma iron ore will be utilized.

A new company, to be known as the FitzGerald Laboratories of Canada, Ltd., will be formed, with Mr. Turnbull, James Kelleher, Niagara Falls, an associate of Mr. Fitzgerald, F. E. Kreusi, Chicago, and J. A. McPhail and A. E. Pickering, Sault Ste. Marie, as directors. Mr. Kelleher will be in charge, acting also as manager of the Superior Alloys, Ltd.

It is expected that the establishment of the laboratory here will lead to other electrochemical and metallurgical industries selecting this as a site for their operations The Sault was chosen partly because of the expected development of the iron and steel industry there and the existence of good shipping facilities and also the fact that the Great Lakes Power Co. agreed to take a substantial financial interest in the project.

To Improve Stove Operation

The Gary plant of the Illinois Steel Co. has made preparations to use fine, cleaned blast furnace gas in four high-efficiency hot blast stoves. Six disintegrators and eliminators, two washing towers, and the checker construction for four hot blast stoves have been purchased from H. A. Brassert & Co., Chicago.

The stoves embody the principles of continuous checker openings from top to bottom in vertical alinement, which permits inspection and gives effective heat transfer by gas and air traveling at equalized velocities through graduated checker openings.

Machinery Exports Far Above Last Year

Ten-Month Total Up 26 Per Cent to a New High Record—Imports Up Nearly One-Half Over 1928

WASHINGTON, Nov. 29.—Making an upturn of $6,203,857, exports of machinery of all kinds in October rose to a value of $53,188,403 from $46,984,546 in September. For the first 10 months they aggregated $515,597,664, an increase of $107,046,573, or 26 per cent, over the corresponding period of 1928, with a value of $408,551,091. A new high record for 10 months has been made, last year having had the previous record. Never before has a full calendar year reached so high a figure as $500,000,000. Exports for October of last year were valued at $43,208,872.

Exports of machinery and vehicles in October were valued at $90,053,421, a gain of $4,738,830 over those in September, valued at $85,314,591, but a decline of $4,753,616 from similar exports in October of last year, valued at $94,817,037. For the 10 months, however, exports of machinery and vehicles reached a total value of $1,045,129,849, reflecting an increase of $183,530,800, or 21½ per cent, over those in the corresponding period last year, valued at $861,599,049.

Exports of industrial machinery, as classified by the Division of Statistics, Department of Commerce, were valued at $24,090,870, an increase of $936,001 over those in September, valued at $23,248,731, and a gain of $4,029,088 over those in October of last year. For the first 10 months they were valued at $234,373,549, an increase of $51,286,565 over the like period of 1928, valued at $183,086,984.

Total exports of power-driven metal-working machinery in October were valued at $2,718,610, compared with $2,490,918 in October of last year. For the first 10 months they were valued at $27,869,772, compared with $21,508,167 in the corresponding period of last year. Exports of metal-working machinery, as listed in THE IRON AGE table, included 973 units, valued at $1,386,312, against 944, valued at $1,595,716, in September.

Imports of machinery and vehicles in October were valued at $3,636,532, compared with $3,115,744 in September and with $2,732,255 in October of last year. They made a sharp gain to $36,141,739 in the 10 months, against $23,927,027 in the corresponding period of last year. Imports of industrial, office and printing machinery in October were valued at $2,544,436, compared with $1,985,300 in September and $1,709,793 in October of last year. For the first 10 months of 1929 they were valued at $21,192,588, an increase of $6,261,183 over the same period of last year, at $14,931,405.

Imports of machinery, as listed in THE IRON AGE table, were valued at $2,648,455 in October, compared with $2,138,908 in September and with $2,161,169 in October of last year. For the 10 months they were valued at $27,421,980, an increase of $9,045,341, or 49 per cent, over those for the corresponding period of last year, valued at $18,376,639.

A striking feature of the October imports was the heavy increase in incoming shipments of metal-working machine tools, which rose to a value of $300,269, against $95,200 in September and only $34,552 in October of last year. For the first 10 months. imports of metal-working machine tools increased sharply to $1,204,679.

Imports of Machinery into the United States

(By Value)

	October		Ten Months Ended October	
	1929	1928	1929	1928
Metal-working machine tools..	$300,269	$34,552	$1,204,679	$467,799
Agricultural machinery and implements	467,338	322,955	7,927,726	4,074,807
Electrical machinery and apparatus	216,803	342,408	2,348,070	2,240,091
Other power-generating machinery	46,225	34,993	1,003,286	573,066
Other machinery.	1,209,865	1,069,162	10,269,537	8,340,152
Vehicles, except agricultural ...	407,955	357,099	4,668,682	2,680,724
Total	$2,648,455	$2,161,169	$27,421,980	$18,376,639

Exports of Power-Driven Metal-Working Machinery

	October, 1929		September, 1929	
	No.	Value	No.	Value
Engine lathes.....	100	$227,454	86	$210,856
Turret lathes	28	101,257	47	140,537
Other lathes.....	82	181,306	110	183,492
Vertical boring mills and chucking machines	6	22,505	11	19,974
Thread-cutting and automatic screw machines	102	145,605	80	99,179
Knee and column-type milling machines...	58	122,461	53	141,800
Other milling machines	41	107,725	60	173,097
Gear-cutting machines	31	88,693	32	125,234
Vertical drilling machines	26	26,381	39	49,465
Radial drilling machines	8	26,567	7	21,798
Other drilling machines	228	51,584	155	44,620
Planers and shapers..	22	46,489	53	64,595
External cylindrical grinding machines..	124	116,673	89	185,962
Internal grinding machines	53	82,978	37	100,482
Metal-working tool-sharpening machines	64	38,634	85	34,625
Total	973	$1,386,312	944	$1,595,716

Machinery Exports from the United States

(By Value, in Thousands of Dollars)

	October		Ten Months Ended October	
	1929	1928	1929	1928
Locomotives	$132	$167	$3,165	$2,716
Other steam engines.....	64	65	656	772
Boilers	121	135	1,750	1,130
Accessories and parts....	116	64	827	527
Automobile engines.....	368	399	9,830	11,910
Other internal combustion engines	821	768	8,545	7,344
Accessories and parts....	313	259	3,691	2,999
Electric locomotives.....	99	28	608	1,157
Other electric machinery and apparatus.....	1,206	746	11,236	6,571
Excavating machinery...	491	519	6,825	6,865
Concrete mixers.....	96	108	1,250	903
Road-making machinery.	158	193	2,847	2,438
Elevators and elevator machinery	523	575	4,592	3,784
Mining and quarrying machinery	1,767	1,116	15,239	11,234
Oil-well machinery.....	2,493	2,005	21,482	12,896
Pumps	927	568	9,725	4,803
Bending and power presses	190	514	2,800	2,246
Power hammers.....	121	107	1,235	717
Machine tools*.....	2,408	1,869	23,825	18,544
Other metal-working machinery and parts.....	620	736	6,316	5,229
Textile machinery.....	1,108	953	11,024	10,686
Sewing machines.....	970	742	8,889	7,129
Shoe machinery.....	109	139	1,612	1,477
Flour-mill and gristmill machinery	46	43	547	378
Sugar-mill machinery....	689	574	3,883	3,869
Paper and pulp-mill machinery	323	326	3,264	2,570
Sawmill machinery.....	63	98	74	769
Other woodworking machinery	206	259	1,991	1,649
Refrigerating and ice-making machinery.....	1,261	638	13,523	7,720
Air compressors.....	705	690	6,571	5,698
Typewriters	1,838	1,638	19,723	17,298
Power laundry machinery	195	103	1,701	980
Typesetting machines....	344	518	4,892	3,889
Printing presses.....	454	607	5,617	5,060
Agricultural machinery and implements.....	10,451	9,046	120,176	99,228
All other machinery and parts	21,392	15,894	175,667	135,366
Total	$53,188	$43,209	$515,598	$408,551

*Details of principal items in another table.

Britain Absorbing Own Pig Iron Output

Continent Looking to Cartel Agreements—Japan to Buy Semi-Finished Steel—Export Rebates for Germany Are Higher

(*By Cable*)

LONDON, ENGLAND, Dec. 2.

THE bank rate reduction has induced pig iron consumers to operate rather more freely, although the market is generally inclined toward seasonal quietness and but little revival is expected before the new year. Cleveland makers are relying entirely on domestic business, as export orders are difficult to obtain. Current output, however, is being fully absorbed.

Hematite producers are well situated and obtaining more remunerative prices from domestic users, but export business is declining.

Finished steel is quiet and producers of heavy material, especially mills rolling for export and plate mills, are in need of orders. Domestic buying is fairly active, but insufficient to satisfy all makers.

Tin plate inquiry continues, but business is dull as a result of the slump in the tin market. Makers are well sold and not pressing for orders. Galvanized sheets are dull and prices easier with reduced production costs. Japan is buying moderately of light gage black sheets.

Clyde shipbuilding in November was nine vessels of 18,700 tons.

The Central Argentine Railway has placed orders for upward of 2000 passenger and freight vehicles with British builders.

Allen West & Co., electrical gear manufacturers, are negotiating for purchase from the Government of the Southampton Rolling Mills, erected for munitions production at a cost of more than £1,000,000, and idle since the end of the war.

Continental markets are awaiting the result of the International Steel Cartel meeting on Tuesday. Cartel members have already agreed to a minimum price on merchant steel bars for export of £5 5s. per ton (1.13c. per lb.), f.o.b. port, and agreements are expected on minimum prices for other finished materials. Meanwhile, the market is quiet, with semi-finished steel prices easy.

Luxemburg production in October was 259,000 tons of pig iron and 242,000 tons of raw steel. The Saar output in October was 179,000 tons of pig iron and 199,000 tons of raw steel.

At the coming meeting of the cartel the practicability of fixing minimum export prices for all member countries will be considered. It is confidently expected that both the International Steel Cartel and the German domestic syndicates will be renewed.

German output of pig iron and steel continues at one of the highest postwar levels, but domestic buying is slack and in export only the Scandinavian countries are buying heavily.

German Export Rebates Increased

(*By Radiogram*)

BERLIN, GERMANY, Dec. 2.

DOMESTIC steel prices are unchanged, although the market shows a tendency to weakness and export prices have receded.

The Ingot Steel Syndicate has increased its price rebates to exporting manufacturers for the month of December, as the International Steel Cartel's recent reduction of 10 per cent in the production quota of members attained only temporary success in advancing prices.

American Used Machinery Stocks in Germany

HAMBURG, GERMANY, Nov. 18.—Certain American exporters of used machinery have selected Frankfort-am-Main as a distributing point for equipment sold to Continental users. Sizable stocks of used metal-working machinery, motors, etc., have been collected at Frankfort for sale to users in Italy, Switzerland, France and Poland.

Japan to Buy Crude Steel

HAMBURG, GERMANY, Nov. 18.—Recently some substantial inquiries for semi-finished steel, especially billets and sheet bars, have been received here from Japan. Cabled inquiries in the past week have called for a total of more than 40,000 tons, but Japanese buyers are slow to place business. Wire rod inquiries from Japan are large.

British and Continental European Export Prices per gross ton, f.o.b. United Kingdom Ports, Hamburg and Antwerp, with the £ at $4.85

British Prices f.o.b. United Kingdom Ports

Cleveland No. 3 foundry	£3	12½s.	to	£3	13½s.	$17.58	to	$17.82
East Coast hematite...	3	18	to	4	1	18.94	to	19.64
Ferromanganese, export	12	5	to	13	0	59.42	to	63.05
Billets, open-hearth....	6	2½	to	6	5	29.71	to	30.31
Sheet bars, open-hearth	6	0	to	6	5	29.10	to	30.31
Black sheets, Japanese specifications	12	10				60.62		
Tin plate, per base box	0	18¾	to	0	19	4.54	to	4.60
Rails, 60 lb. and heavier	7	15	to	8	15	37.59	to	42.43
						Cents per Lb.		
Steel bars, open-hearth.	7	15	to	8	10	1.67	to	1.84
Beams, open-hearth....	7	2½	to	7	12½	1.55	to	1.65
Channels, open-hearth..	7	7½	to	7	17½	1.60	to	1.71
Angles, open-hearth....	8	2½	to	8	12½	1.76	to	1.86
Ship plates, open-hearth	7	12½	to	8	2½	1.66	to	1.76
Black sheets, No. 24 gage	10	0	to	10	5	2.17	to	2.21
Galvanized sheets, No. 24 gage	12	12½	to	12	15	2.73	to	2.76

Continental Prices, f.o.b. Antwerp or Hamburg

Foundry iron, 2.50 to 3.00 per cent sil.. 0.50 to 0.90 per cent phos.	£3	8s.	to	£3	11½s.	$16.49	to	$17.33
Foundry iron, 2.50 to 3.00 per cent sil., 1.00 per cent and more phos.	3	7	to	3	8	16.24	to	16.49
Billets, Thomas.....	4	11	to	4	12	22.07	to	22.31
Sheet bars, Thomas....	4	10½	to	4	11	21.95	to	22.07
Wire rods, low C., No. 5 B.W.G.....	6	3	to	6	5	29.82	to	30.30
Rails, 60 lb. and heavier	6	8½	to	6	10*	31.16	to	31.52
Rails, light	6	1½				29.46		
						Cents per Lb.		
Steel bars, merchant...	5	5				1.13		
Steel bars, deformed...	5	4				1.12		
Beams, Thomas, British standard	5	1½	to	5	2½	1.10	to	1.11
Channels, Thomas, American sections...	5	13	to	5	17	1.24	to	1.26
Angles, Thomas, 4-in. and larger, over ⅜-in. thick.....	5	0	to	5	6	1.08	to	1.15
Angles, Thomas, 3-in...	5	6				1.14		
Ship plates, open-hearth inspected	7	2	to	7	5	1.54	to	1.57
Black sheets, No. 31 gage, Japanese	12	4				2.68		
Hoop and strip steel over 6-in. base.....	5	11½	to	5	12½	1.21	to	1.22
Wire plain, No. 8 gage	7	2½	to	7	3½	1.54	to	1.55
Wire, galvanized, No. 8 gage	8	12½	to	8	13½	1.87	to	1.88
Wire, barbed, 4-pt. No. 12 B.W.G.....	11	5	to	11	6	2.44	to	2.45
Wire nails, base.....	0	6¼				$1.54	per	keg
Wire nails, assortments 1 to 6-in. keg.....	10	6½				2.23		

*Open-hearth steel, 8s. ($1.94) per ton extra.

Machinery Markets and News of the Works

Month's Tool Sales Normal

Sentiment in the New York Machinery Trade Is Decidedly More Cheerful

ALTHOUGH machine tool buyers are showing an increasing conservatism in placing orders, November turned out to be about normal as business is measured at the end of the year.

Comparing it with the corresponding month of previous years, November established a favorable sales record; it suffers only when it is put alongside the high records of earlier months of the year.

Sentiment in the machinery trade in the New York district is decidedly more cheerful, a gain in both orders and inquiries being responsible for the feeling of optimism. In some centers throughout the country, however, a slow but steady recession in business has been interpreted as a forerunner of light business in December, a month which ordinarily is affected by a seasonal lull and by the end-of-the-year inventory period.

Deliveries on some lines of tools have shortened, but only in a few cases are builders able to promise shipment this month. Moreover, numerous plants still have enough unfilled orders to carry operations along at a satisfactory rate for at least the next 60 days.

Among the past week's tool buyers were the Standard Underground Cable Co., the Western Electric Co., the New York Central Railroad, a New Jersey printing press manufacturer, the Westinghouse company and the Thew Shovel Co., Lorain, Ohio. The United Engineering & Foundry Co., Pittsburgh, which is enlarging its Canton, Ohio, plant, has purchased four large turret lathes from a Cleveland company.

Users which recently have put out inquiries for tools include the United States Aluminum Co., Goodyear Tire & Rubber Co., the Illinois Steel Co., the Chicago & North Western, an independent steel maker and the Chicago, St. Paul, Minneapolis & Omaha.

New York

NEW YORK, Dec. 3.—Sentiment in the local machinery trade is decidedly more cheerful. Not only were orders slightly better in the past week than in the week before, but machine tool sellers received a considerable number of inquiries, and investigation of these established the fact that in practically all instances early purchases may be expected. It is pointed out that machine tool business is still very good; it suffers only by comparison with some of the high monthly records of earlier months of the year. November orders compared very favorably with the same month in other years. Deliveries have shortened on some lines of tools, but only in a few cases are shipments earlier than January being promised. Among the buyers of the week were the Standard Underground Cable Co., the Western Electric Co., the New York Central Railroad and a New Jersey printing press manufacturer.

Edwards & Co., 140th Street and Exterior Avenue, New York, manufacturer of time recording instruments, fire alarm apparatus, etc., has awarded general contract to Barney Ahlers Construction Corporation, 110 West Fortieth Street, for three-story addition, to cost about $80,000 with equipment.

Slee & Bryson, 160 Montague Street, Brooklyn, architects, will soon take bids on general contract for multi-story automobile service, repair and garage building, to cost more than $175,000 with equipment.

International Paper Co., 100 East Forty-second Street, New York, is acquiring property at Chatham, N. B., as site for new newsprint mill on which work will begin next year. Initial unit will have output of about 100 tons per day and will cost more than $2,500,000.

Board of Education, Tuckahoe, N. Y., plans installation of manual training equipment in new three-story high and grade school to cost about $600,000, for which bids are being asked on general contract until Dec. 10. Knappe & Morris, 171 Madison Avenue, New York, are architects.

National Biscuit Co., 85 Ninth Avenue, New York, has authorized an increase in capital from $85,000,000 to $145,000,000, part of fund to be used for expansion and improvement, including construction of additional baking plants and acquisition of existing plants.

Kohler Co., 711 Fifth Avenue, New York, manufacturer of sanitary ware, with main plant at Kohler, Wis., has awarded general contract to G. H. Fuller, Fuller Building, for six-story factory branch, storage and distributing plant at Long Island City, N. Y., to cost over $200,000 with equipment. Buchman & Kahn, 2 Park Avenue, New York, are architects.

Cities Service Co., 60 Wall Street, New York, operating electric light and power properties in different parts of country, as well as oil and gas properties, is arranging an expansion and improvement program to cost about $150,000,000, of which about $60,000,000 will be used for extensions in natural gas facilities, and close to like sum for extensions in oil properties, including pipe line construction, steamship transportation, etc.

Murray Klein, 65 Court Street, Brooklyn, architect, will soon take bids on general contract for one-story automobile service, repair and garage building, to cost about $100,000 with equipment.

Officials of United Aircraft & Transport Corporation, 51 Pine Street, New York, have organized United Airports of California, Inc., as a subsidiary. New company will take over airports of parent organization at Burbank Field, Los Angeles, and Pratt & Whitney Field, East Hartford, Conn.; it will also establish and operate airports in other parts of country, including servicing and repair facilities for aircraft.

United Electric Light & Power Co., 130 East Fifteenth Street, New York, has plans for a one-story addition to power plant at Locust Avenue and 134th Street, to cost over $100,000 with equipment.

Federal Shipbuilding & Dry Dock Co., Kearny, N. J., will carry out expansion and improvements at shipyard on Hackensack River, to provide in part for construction of larger vessels. Two large shipways will be built, with shops and equipment-handling facilities, elevating and conveying apparatus. Two existing shipways will be enlarged and improved, and additional mechanical shops provided. Entire program will cost over $200,000.

Ford Motor Co., Detroit, has awarded general contract to Turner Construction Co., 420 Lexington Avenue, New York, for new assembling plant at Edgewater, N. J., to replace present works at Kearny, N. J., lately sold to Western Electric Co. New plant at Edgewater will consist of main two-story unit, 360 x 1500 ft., and two one-story structures, each 50 x 113 ft., to cost over $1,000,000 with equipment. Albert Kahn, Inc., Marquette Building, Detroit, is architect and engineer.

Board of Education, 31 Green Street, Newark, will receive bids until Dec. 12 for machine shop and wood-working machinery, steel lockers and shelving, automobile shop equipment, exhaust fans, air compressors and pumps, electrical supplies, and other electrical and mechanical equipment. R. D. Argue is secretary.

M. Arthur Wolf, 845 Broad Street, Newark, architect, has plans for a three-story automobile service, repair and garage building, 160 x 200 ft., to cost about

$140,000, and will ask bids on general contract early next year.

Grasselli Chemical Co., Guardian Building, Cleveland, a subsidiary of E. I. duPont deNemours & Co., Wilmington, Del., manufacturer of industrial chemicals, etc., is considering expansion at plant at Grasselli, near Linden, N. J., to cost over $1,000,000 with machinery.

Philadelphia

PHILADELPHIA, Dec. 2.—R. D. Wood Co., 400 Chestnut Street, Philadelphia, manufacturer of hydraulic machinery and parts, automatic gas producers, etc., has taken bids on general contract for one-story machine shop, 100 x 240 ft., at plant at Florence, N. J., to cost more than $100,000 with equipment.

Shell Eastern Petroleum Products Co., Elverson Building, Philadelphia, a subsidiary of Shell Petroleum Corporation, Shell Building, St. Louis, has asked bids on general contract for new oil storage and distributing plant near Luzerne and D Streets, where tract was recently acquired, to cost about $125,000 with equipment. Plans have been filed for a pumping plant at that location, as well as for one-story automobile service and garage building. Headquarters are at 122 East Forty-second Street, New York.

Titgen-Eastwood Co., 3562 Salmon Street, Philadelphia, manufacturer of foundry equipment, has acquired one-story building, heretofore held by Quaker City Iron Works Co., and will develop as main plant. Structure has previously been occupied under lease. Quaker City company will retain building at Tioga and Edgemont Streets, adjoining, for foundry.

Crane Co., 212 South Thirteenth Street, Philadelphia, with headquarters at 836 South Michigan Avenue, Chicago, has taken bids on general contract for new factory branch and distributing plant, to cost more than $75,000 with equipment. Stearns & Woodnutt, Stephen Girard Building, are architects.

Alan Wood Mining Co., recently formed as subsidiary of Alan Wood Steel Co., Conshohocken, Pa., to operate iron ore properties at Wharton and Oxford, N. J., is arranging appropriation of more than $500,000 for extensions and improvements in properties, mill buildings and additional machinery.

Commissioner of Institutions and Agencies, State Office Building, Trenton, N. J., is asking bids until Dec. 16 for turbine-driven generators for New Jersey State Hospital at Hillsdale. William J. Ellis is commissioner.

United States Cast Iron Pipe & Foundry Co., Burlington, N. J., will soon take bids on general contract for two and three-story wing addition, 60 x 100 ft., to cost over $50,000. Ballinger Co., 105 East Twelfth Street, Philadelphia, is architect and engineer.

E. I. du Pont de Nemours & Co., Wilmington, Del., is arranging for expansion to cost about $25,000,000, including projects now under way, comprising a paper manufacturing plant for duPont Cellophane Co., at Old Hickory, Tenn.; extensions for duPont Ammonia Corporation, Belle, W. Va., and new unit for duPont Viscoloid Co., Leominster, Mass. Included in new program are additions to machine shops at Wilmington, used for manufacture of special machinery for subsidiary interests, to cost over $75,000. Work is under way on addition to experimental plant at Brandywine, Del., to cost $50,000 with equipment.

Board of Education, Chambersburg, Pa., is considering installation of manual training equipment in new two-story senior high school at Queen and Third Streets, to cost $275,000, for which bids will be asked on general contract early next year. Lawrie & Green, 821 North Third Street, Harrisburg, Pa., are architects.

Middleton-Hyde Mfg. Co., Philadelphia, recently organized by Harry C. Middleton, Jr., 324 Florist Street, and associates, is considering early operation of local plant for manufacture of hardware products. Mr. Middleton will be treasurer of company; John G. Hyde, 1432 North Seventeenth Street, will be one of company officials.

The Crane Market

MANY of the current inquiries for material handling equipment are for inventory purposes, or to obtain prices to be used in appropriations for next year. Certain companies in the market for overhead traveling cranes are delaying action until the beginning of the new year and some business in locomotive cranes is generally expected to carry over into January. The Standard Oil Co. of New Jersey, which has been inquiring for two 25-ton locomotive cranes for Bayway, N. J., has postponed purchase until the 1930 appropriation is available. The Anglo-Chilean Consolidated Nitrate Corporation, New York, in the market for a 25 and 35-ton locomotive cranes and two 5-ton cranes mounted on motor-trucks has not yet definitely decided upon the construction in Chile which would require these cranes.

Among recent purchases are:

Bethlehem Steel Co., Bethlehem, Pa., 25-ton, gasoline-driven locomotive crane for Buffalo from American Hoist & Derrick Co.

Davison Chemical Co., Baltimore, 25-ton, steam-driven locomotive crane reported purchased from Industrial-Brownhoist Corporation.

Beauharnois Light, Heat & Power Co., Montreal, two 30-ton locomotive cranes from Browning Crane Co.

Anaconda Copper Mining Co., 25 Broadway, New York, 10-ton, bucket handling gantry crane for Montana from Shaw Electric Crane Co.

Phoenix Utility Co., 71 Broadway, New York, 20-ton, 1-motor, overhead crane from Whiting Corporation.

Locomotive Finishing Material Co., Atchison, Kan., three electric overhead cranes from a Wisconsin builder.

Wyatt Co., Dallas, Tex., 15-ton overhead traveling crane from Whiting Corporation.

Mine La Motte Co., Bonne Terre, Mo., 10-ton, electric traveling crane from Manning, Maxwell & Moore, Inc.

Buffalo

BUFFALO, Dec. 2.—Officials of Sterling Range & Furnace Corporation, 524 Oak Street, and Co-Operative Foundry Co., 25 Lincoln Avenue, Rochester, N. Y., are organized new company under name of Sterling-Red Cross Corporation, to take over and consolidate both interests. New company will carry out expansion and improvement program.

Corning Glass Co., Corning, N. Y., manufacturer of special baking glassware, etc., has awarded general contract to H. K. Ferguson Co., Cleveland, for addition to plant to cost over $500,000 with equipment.

New York State Industrial School, Industry, near Buffalo, Dr. Andrew G. Johnson, superintendent, is planning construction of 14 trade school buildings at institution, each one story, for instruction in mechanical and building trades. A main unit is now in course of completion, to cost about $200,000 with equipment.

Joseph A. Firsching, Jr., 1631 Bennett Street, and Howard Brodt, 1201 Stark Street, Utica, have organized Joseph A. Firsching, Jr., Inc., and plan operation of local factory for manufacture of machinery and parts.

New York State Electric Corporation, Ithaca, N. Y., a subsidiary of Associated Gas & Electric Co., 61 Broadway, New York, is concluding arrangements for purchase of Delaware & Otsego Light & Power Co., Franklin, N. Y., and will consolidate. Plans are under way for expansion, including construction of transmission line to connect both systems.

Ogden R. Adams, Cutler Building, Buffalo, machine tool dealer, has been appointed district representative of Reisinger Machine Co., Rochester, N. Y., manufacturer of adjustable hollow mills.

New England

BOSTON, Dec. 3.—Some local machine tool dealers did an average business in November, but with the majority sales fell off. No new inquiries of importance have developed and those pending give no indication of closing until after Jan. 1. New England machine tool builders generally are active and well booked ahead.

American Brass Co., Waterbury, Conn., is taking bids on a one-story, shipping department addition, 43 x 64 ft. Conveying equipment is under consideraton.

Martin Trailer Co., Westfield, Mass., will erect a one-story plant, 80 x 100 ft., to cost $40,000 without equipment.

City of South Norwalk, Conn., closes bids Dec. 10 for a junior high school, which will include a manual training department, to cost $350,000.

Florence Stove Co., Gardner, Mass., has started work on a 30 x 90 ft. enameling furnace.

Wilcox, Crittendon & Co., Inc., Middletown, Conn., closes bids this week on a two-story foundry, 100 x 187 ft., with a one-story wing, 25 x 48 ft.

G. & O. Mfg. Co., New Haven, Conn., automobile radiators, etc., will shortly start work on a two-story and basement addition, 40 x 85 ft.

State Board of Education, Hartford, Conn., has plans for new trade school at Meriden, Conn., consisting of three-story L-shaped unit, 120 x 180 ft., with wing 60 x 60 ft. A machine shop, wood-working shop, plumbing shop and other mechanical departments will be installed. It will cost over $175,000 with equipment. Lorenzo Hamilton, Inc., Meriden, is architect.

Maine Seaboard Paper Co., recently organized by Walter S. Wyman, president, Central Maine Power Co., 317 Water Street, Augusta, Me., and associates, has authorized construction of new mill at Bucksport, Me., where property has been acquired. Plant will consist of several units and will cost more than $5,000,000. Company has also purchased about 400,000 acres of timberland in eastern part of State, and will develop for raw material supply.

Rice, Barton & Fales Co., Tainter Street, Worcester, Mass., manufacturer of paper-making machinery and parts, has awarded general contract to E. J. Cross Co., Worcester, for extensions and improvements, to cost about $25,000.

Taunton & New Bedford Copper Co., North Front Street, New Bedford, Mass., has asked bids on general contract for one and two-story addition, including improvements in present factory, to cost about $45,000 with equipment.

Superior Spring & Mfg. Co., 373 Washington Street, Hartford, Conn., will take bids at once for one and two-story addition, 60 x 128 ft., to cost about $30,000 with equipment. George L. Dunkelberger, Hartford, is architect.

Warren Foundry & Pipe Co., 201 Devonshire Street, Boston, will ask bids early next year for new pipe foundry, storage and distributing plant at Everett, Mass., to cost over $40,000 with equipment. French & Hubbard, 210 South Street, Boston, are architects.

Springfield Bronze & Aluminum Co., Page Boulevard, Springfield, Mass., has awarded general contract to Austin Co., Cleveland, for one-story addition, 82 x 142 ft., to cost about $45,000 with equipment.

Rising Paper Co., Housatonic, Mass., a subsidiary of Strathmore Paper Co., Mittineague, Mass., has plans for three-story finishing department addition, 75 x 180 ft., to cost more than $90,000 with machinery.

City Council, New Haven, Conn., has plans for municipal airport at Morris Cove, to include hangars, repair shops and other field units, to cost about $85,000 with equipment. Westcott & Mapes, 139 Orange Street, are architects and engineers.

Connecticut Broach & Machine Co., New London, Conn., has removed its manufacturing plant and offices from 376 Bank Street to 35 Pequot Avenue.

South Atlantic

BALTIMORE, Dec. 3.—Consolidated Gas, Electric Light & Power Co., Lexington Building, Baltimore, is arranging an expansion and improvement program to cost about $7,500,000, including extensions in generating facilities, transmission lines, underground conduits and other work. Company has plans for one-story addition to switching plant on Kloment Street, to cost about $50,000.

Eastern Rolling Mill Co., Sewer Road, Baltimore, has authorized an expansion and betterment program to cost about $325,000 with equipment, to be carried out over five months' period.

Washington Air Terminals Corporation, National Press Building, Washington, has plans for steel hangar, 100 x 135 ft., with repair and reconditioning facilities, at local airport, to cost more than $85,000 with equipment. Lockwood Greene Engineers, Inc., 100 East Forty-second Street, New York, is engineer.

Glamorgan Pipe & Foundry Co., Lynchburg, Va., has arranged for increase in capital stock for general expansion. S. M. Lloyd is president.

American Tobacco Co., Twenty-sixth and Cary Streets, Richmond, Va., has awarded general contract to Wise Granite & Construction Co., American National Bank Building, for new three and six-story factory at Richmond, 210 x 270 ft., to cost over $1,000,000, with power house, mechanical-handling, conveying and other equipment. J. E. Sirrine & Co., 215 South Main Street, Greenville, S. C., are architects and engineers.

Crown Oil & Wax Co., 200 South Eighth Street, Baltimore, will soon take bids for three-story automobile service, repair and garage building, to cost about $100,000 with equipment.

Victory Sparkler & Specialty Co., Elkton, Md., has leased factory of Bibbs Foundry Co., Port Deposit, Md., and will remodel for new branch plant for sparkler novelties of metal and other materials.

Washington Railway & Electric Co., Fourteenth and C Streets, N. W., Washington, will take bids on general contract for two-story motor bus service, repair and garage building, to cost about $200,000 with equipment.

Weston & Brooker Co., Grand Building, Columbia, S. C., has purchased quarry properties of A. T. Small, Macon, Ga., and is reported planning expansion, including installation of quarrying and other mechanical equipment.

Public Improvement Commission, City Hall, Baltimore, is considering construction of addition to Polytechnic Institute, with vocational training facilities, to cost $1,000,000, and will develop plans in connection with 1930 school expansion and improvement program. Herbert J. Leimbach is chief engineer, in charge.

Detroit

DETROIT, Dec. 2.—Detroit Stoker Co., 1510 East First Street, Monroe, has awarded general contract to Austin Co. for one-story unit, to cost about $35,000 with equipment. R. M. Dunbar, 4 South Front Street, Monroe, is architect.

Boyer-Campbell Co., Brush and Congress Streets, Detroit, tools, factory equipment and appliances, etc., is arranging for early removal to new four-story storage and distributing plant on Antoine Street, in course of construction, where operations will be expanded.

United States Rubber Co., 6600 East Jefferson Street, Detroit, will carry out expansion program at local mill and install additional equipment, to cost about $200,000. L. D. Tompkins is general manager of tire-manufacturing department. Headquarters are at Broadway and Fifty-eighth Street, New York.

City Commission, Kalamazoo, has leased part of Lindbergh Field, where city airport is now maintained, for construction of one-story airplane service and repair works, to cost more than $45,000 with equipment.

Board of Education, Harrison and Eighth Streets, Flint, is considering installation of manual training equipment in addition to Northern high school, to cost about $500,000, for which bids will be asked on general contract next spring. Malcolmson & Higginbotham, 1219 Griswold Street, Detroit, are architects.

Traveling ovens, power equipment, conveying machinery and other mechanical equipment will be installed in new plant, 80 x 200 ft., to be erected at Detroit by General Baking Co., 420 Lexington Avenue, New York, to cost over $800,000. C. B. Comstock, 122 East Forty-second Street, New York, is architect and engineer.

Plant and business of Century Boat Co., Manistee, have been acquired by new interests, headed by John A. Hacker, Detroit, which will take immediate possession. New company will be formed, retaining Century name, with capital of $200,000, to operate plant for production of outboard motor craft. Expansion and improvements are planned.

Dow Chemical Co., Midland, manufacturer of industrial chemicals, etc., will carry out expansion and install additional equipment. Company has arranged increase in capital, part of proceeds to be used for purpose noted, to cost more than $100,000.

Board of Education, Hamtramck, is considering installation of manual training equipment in two and three-story junior high school to cost about $750,000, for which bids will be asked on general contract in about 60 days. B. C. Wetzel & Co., Dime Bank Building, Detroit, is architect.

Public Lighting Commission, 174 East Atwater Street, Detroit, has awarded general contract to Martin & Kraussman Co., 955 East Jefferson Street, for extensions and improvements in former boiler station at East Atwater and Randolph Streets, four stories, 50 x 210 ft., to convert structure for equipment storage and distributing unit, with repair division, to cost $165,000. Smith, Hinchman & Grylls, Marquette Building, are architects.

Allied Die Casting Co. of America, Detroit, manufacturer of die cast automobile parts, has been incorporated by C. Sorenson, W. Friess and C. T. Fisher, and is in operation at 7420 Melville Street.

Pittsburgh

PITTSBURGH, Dec. 3.—November machine tool sales in this district declined somewhat, as compared with October, but were considered satisfactory in view of the uncertainty of general business conditions. Purchases were confined largely to single tools, and in many cases early delivery was urged, indicating that buyers are interested in taking care only of urgent needs. New inquiry is also lighter than early in the fall, and although the list of pending tools is still large, it is no longer increasing to any marked extent and some buyers have definitely postponed purchases until after the first of the year.

Westinghouse Electric & Mfg. Co., East Pittsburgh, has closed on the majority of tools on its fourth quarter list, but United States Aluminum Co. still has a number of items to buy on a supplementary list issued several weeks ago. Railroads are not buying as yet, but dealers hope to see a strong demand from the carriers in the near future.

Spang, Chalfant & Co., Inc., Clark Building, Pittsburgh, manufacturer of welded and seamless tubular products, has plans for extensions and improvements in plant at Etna, Pa., including electrification of works. Present isolated power plant will be discontinued. New one-story units will be built and additional machinery installed, to cost about $450,000.

Oliver Iron & Steel Corporation, 1001 Muriel Street, Pittsburgh, has plans for a one-story addition, to cost about $40,000 with equipment.

Sutton Engineering Co., Bellefonte, Pa., manufacturer of mechanical products, is considering construction of one-story machine shop, reported to cost about $45,000 with equipment. E. T. Risen is general manager.

Brockway Machine Bottle Co., Brockway, Pa., will carry out expansion at plant, including one-story additions, 90 x 160 ft., and 50 x 100 ft., to cost about $80,000 with equipment.

Blaw-Knox Co., Blawnox, Pittsburgh, has begun an expansion and betterment

program at local mill, to include installation of additional equipment, to cost about $250,000. An addition will be built to plant of Lewis Foundry & Machine Co., Groveton, recently acquired.

West Virginia Coal & Coke Co., First National Bank Building, Huntington, W. Va., is arranging for expansion at coal-mining properties at Logan, W. Va., including construction of new steel tipple at Mine 45, installation of conveying, dumping and other equipment at Omar mine, where a wire-rope haulage system, mine cars and other machinery will be installed. Entire program will cost more than $100,000. T. A. Stroup is chief engineer in charge.

M. Nirdlinger, Empire Building, Pittsburgh, architect, has plans for automobile service, repair and garage building, to cost about $140,000 with equipment.

Mill Creek Coal & Coke Co., Maybury, W. Va., is considering rebuilding tipple at local Elkhorn colliery destroyed by fire Nov. 25.

Chicago

CHICAGO, Dec. 3.—Both new buying and fresh inquiries continue to taper. However, dealers, in summing up business for November, find the total volume to be near their estimate of normal for this time of year. Of considerable importance in gaging the present market is the fact that cancellations of existing orders have been made only in a few unimportant cases. It is quite noticeable that buyers are much less insistent on deliveries than at the time orders were signed. Agricultural machinery manufacturers are still in the market, but are paying closer attention to orders placed.

Illinois Steel Co. is expected to issue a sizable list for a new machine shop. An independent steel producer is in the market for a radial drill and a planer. Chicago & North Western will buy two rotary shears, one for ½-in. and one for 1-in. plate. Chicago, St. Paul, Minneapolis & Omaha will purchase an 18-in. lathe, an 18-in. motor-driven grinder and a 36-in. drill.

Edgar T. Ward Sons & Co., 1455 West Thirty-seventh Street, Chicago, headquarters at Pittsburgh, has plans for a one and two-story factory branch, storage and distributing plant, to cost about $120,000 with equipment. A. Epstein, 2001 Pershing Road, is architect and engineer.

Utilities Power & Light Corporation, 327 South LaSalle Street, Chicago, operating electric light and power utilities in different parts of country, is arranging an expansion and improvement program to cost about $60,000,000, including completion of new steam-operated electric power plants of subsidiary companies, extensions in transmission lines, as well as expansion in gas properties and other work.

Grant Storage Battery Co., 226 North Second Street, Minneapolis, Minn., manufacturer of electric storage batteries, has awarded a general contract to August Cederstrand & Co., 966 Central Avenue, for a one-story addition, 200 x 300 ft., to cost about $100,000 with equipment. O. L. Schultz is president and treasurer.

Laurel Oil & Refining Co., Laurel, Mont., recently organized, has approved plans for a new refinery on local site for production of fuel oil, gasoline, road oil, asphalt and affiliated by-products. Initial plant will cost close to $850,000 and will be ready for service in spring. Smith Engineering Co., 107 West Linwood Boulevard, Kansas City, Mo., is engineer. Alfred J. Diescher, formerly vice-president and general manager of Empire properties of Cities Service Co., 60 Wall Street, New York, heads new organization.

Illinois Steel Co., 208 South La Salle Street, Chicago, has plans for a one-story machine shop, 50 x 300 ft., at South Chicago works, to cost $250,000 with equipment. L. C. B. Holmboe is company architect.

Northern Pacific Railway Co., 176 East Fifth Street, St. Paul, Minn., has awarded general contract to E. G. Evensta Co., 2135 California Street, N. E., Minneapolis, Minn., for additions to engine house with shop facilities at Mandan, N. D., to cost about $70,000. O. M. Regnan is company architect.

Charles A. Olson & Son, Inc., 2945 Pillsbury Avenue, Minneapolis, manufacturer of commercial automobile bodies, has asked bids on general contract for a one and two-story plant unit, to cost about $40,000 with equipment. C. J. Bard, Builders' Exchange, is architect.

International Harvester Co., 606 South Michigan Avenue, Chicago, will soon begin erection of two-story and basement factory branch and distributing plant at Sioux City, Iowa, 150 x 225 ft., to cost about $150,000 with equipment.

Gerrard Co., Inc., Cicero, Ill., manufacturer of wire-tying machinery, has started construction of a two-story factory and office building, 130 x 250 ft., at 2915 West Forty-seventh Street, Chicago. Mundie & Jensen are architects.

Milwaukee

MILWAUKEE, Dec. 3.—Machine tool buying is slowly increasing after a lull which was at no time pronounced. Inquiries are also more frequent and come from various industries. Jobbing machinists are in the market to a much greater extent than recently. Improvement in deliveries of machine tool is noted by some builders. Manufacturers of large tractors and excavating equipment are operating at close to capacity and output is being gradually increased by makers of automobiles, automotive equipment, farm implements and small tractors.

Davis & Thompson Co., Fifty-seventh Avenue and Mitchell Street, West Allis, Wis., manufacturer of drilling, milling, pipe-threading and special machines, reports orders sufficient to keep plant operating at capacity until June. Recent business includes special machines for Soviet Government's tractor plant.

Trane Co., LaCrosse, Wis., manufacturer of heating specialties, plans expansion through an increase of capital stock from $600,000 to $800,000.

Portage Mfg. Co., Portage, Wis., manufacturer of ice cream freezers, vacuum cleaners and other household specialties, recently incorporated for $125,000, has begun manufacturing operations in temporary quarters at 2718 Atwood Avenue, Madison, Wis., pending completion of plant at Portage, construction of which will begin in spring. J. E. Hoffman, of Hoffman Mfg. Co., Chicago, is designer of some products and is active in new company.

John Deere Plow Co., Moline, Ill., has let contract to John Hunzinger Construction Co., 144 East Wells Street, Milwaukee, for a five-story warehouse and office building, and one-story loading platform, 26 x 102 ft.

Briggs & Stratton Corporation, Milwaukee, manufacturer of automobile ignition switches, window lifters, air compressors and gasoline engines, announce expansion in its line of portable gasoline engines through production of a 2-hp. high-speed engine weighing 40 lb., built largely of aluminum, also a new 3-hp. light-weight motor.

Young Radiator Co., Racine, Wis., is planning to double its manufacturing capacity by installation of additional equipment and by augmenting its personnel. Company, of which F. M. Young is president, makes industrial type internal combustion engine cooling radiators for trucks, power units and industrial machinery, hot water automobile heaters and new type forced draft heating units for factories and buildings.

Cincinnati

CINCINNATI, Dec. 2.—Sales of machine tools the past week were well below the average weekly volume of the past three or four months. A number of contracts are pending on which buyers have received quotations, but have not yet signified any immediate intention of closing. Among these is one from the Russian Government for a quantity of lathes, on which quotations were submitted sometime ago. While inquiry is in fair volume, it is not as brisk as two weeks ago. District plants are operating on good schedules and no slackening of production is anticipated for some time.

Cincinnati Engineering Tool Co., 4659 Spring Grove Avenue, Cincinnati, has awarded general contract to Fisher-Devore Construction Co., Dixie Terminal Building, for one-story unit at Knowltons Corner, to cost about $45,000 with equipment.

Dayton Rubber Mfg. Co., Dayton, Ohio, manufacturer of automobile tires, mechanical rubber goods, etc., is considering purchase of site at Los Angeles for new branch plant, to cost more than $1,000,000 with machinery.

Smith Agricultural Chemical Co., Columbus, Ohio, fertilizer products, has awarded general contract to Middle States Construction Co., 1183 Essex Avenue, for a one-story storage and distributing plant, to cost about $40,000 with equipment. Improvements will also be made in present plant.

Nashville Gas & Heating Co., 226 Sixth Avenue, North, Nashville, Tenn., a subsidiary of United Gas Improvement Co., 1401 Arch Street, Philadelphia, is arranging for expansion to cost about $370,000, including increased gas-generating facilities, storage and distributing units.

Prichett-Thomas Co., Stahlman Building, Nashville, Tenn., has broken ground for new multi-story automobile service, repair and garage building, to cost about $400,000 with equipment. Marr & Holman, Stahlman Building, are architects.

Procter & Gamble Co., Gwynne Building, Cincinnati, has acquired property at Long Beach, Cal., for early construction of new plant for Pacific Coast trade, to cost about $5,000,000 with machinery. Work is in progress on similar plant at Baltimore.

North American Utilities Co., Madisonville, Ky., recently formed by W. B. Doty, Madisonville, and associates, is planning construction of artificial gas plant near Paris, Tenn., to cost about $100,000 with

equipment. Company plans pipe lines for service at Mayfield and Fulton, Ky., and vicinity.

Brown Wood Preserving Co., Louisville, recently formed as a subsidiary of W. P. Brown & Sons Lumber Co., Louisville, will install a boiler plant in connection with wood-treating and preserving plant at Highland Park, also storage tanks, pumps, air compressors, etc., as well as conveying and elevating equipment. Entire project will cost over $1,000,000 with equipment. J. Graham Brown is president. Grant B. Shipley, Koppers Building, Pittsburgh, is consulting engineer.

Board of Education, Norwood, Ohio, is considering installation of manual training equipment in addition to junior high school to cost $300,000. Charles F. Collarius, St. Paul Building, Cincinnati, is architect.

Cleveland

CLEVELAND, Dec. 3.—While the volume of machine tool business has shown a considerable decline recently, there is still quite a little activity. The United Engineering & Foundry Co., Pittsburgh, which is enlarging its Canton, Ohio, plant, purchased four large turret lathes the past week from a Cleveland dealer, involving an expenditure of about $50,000. The Thew Shovel Co., Lorain, added to its recent purchase a 42-in. boring machine and is inquiring for a 27-in. lathe. This company may buy one or two additional machines early in the year. The Goodyear Tire & Rubber Co., Akron, has an inquiry out for two small machines.

November sales showed quite a falling off as compared with October and little activity is looked for in December. However, quite a few plants in various metal-working industries are considering the purchase of new equipment, but are deferring placing orders until January.

E. I. Du Pont de Nemours Co., Wilmington, Del., has awarded a contract to Austin Co., Cleveland, for a one-story machine shop, 90 x 197 ft., to cost about $75,000.

Hammond Mfg. Co., 7808 Kinsman Road, Cleveland, manufacturer of drilling machinery, will erect a new one-story factory, 75 x 129 ft.

Strong, Carlisle & Hammond Co., Cleveland, has been given exclusive sales agency in Cleveland territory for line of milling machines made by Kempsmith Mfg. Co.

General Fireproofing Co., Youngstown, plans to start operating this month a new plant to manufacture aluminum office chairs.

Firestone Tire & Rubber Co., Akron, Ohio, has authorized expansion and improvements at branch mill at Los Angeles, to cost about $2,500,000 with machinery. Work is scheduled for completion within 60 to 90 days. Company has plans by Lockwood Greene Engineers, Inc., Hanna Building, Cleveland, for three-story factory branch, service and distributing plant at Toledo, Ohio, to cost about $200,000 with equipment.

Atlas Steel & Supply Co., 4401 Trumbull Avenue, Cleveland, has asked bids on general contract for three-story addition to storage and distributing plant, to cost more than $65,000 with equipment. Walter J. Wefel, 5716 Euclid Avenue, is architect.

Thew Shovel Co., Lorain, Ohio, manufacturer of steam and gasoline shovels, etc., is planning expansion to cost about $100,000 with equipment.

Youngstown Radio, Lamp & Novelty Co., Scienceville Road, Youngstown, Ohio, will ask bids on general contract early in January for one and two-story addition, to cost about $25,000 with equipment. Zenk & Campbell, 120 Wood Street, are architects.

St. Louis

ST. LOUIS, Dec. 2.—J. R. Brockman Mfg. Co., 617 North Second Street, St. Louis, manufacturer of pipe, pipe bends, etc., is considering one-story plant unit at 3806-16 Market Street, to cost over $80,000 with equipment.

Hoffman Aircraft Co., 1010 Pine Street, St. Louis, has plans for a one-story steam power plant, 30 x 40 ft., at Anglum, Mo., airport, to cost about $35,000 with equipment. B. Russell Shaw, Arcade Building, is architect.

Fremont Foundry & Bearing Works, Inc., 1338 West Fifth Place, Oklahoma City, Okla., will build a one-story factory branch, service and distributing shop at Tulsa, Okla., with facilities for repair of mechanical equipment used in oil field operations, to cost about $25,000 including equipment.

Edward J. Peters, Elks Building, Shawnee, Okla., architect, has awarded general contract to Tankersley Construction Co., Cotton Exchange Building, Oklahoma City, for three-story and basement automobile service, repair and garage building, 125 x 160 ft., at Oklahoma City, to cost about $120,000 with equipment.

Hussman-Ligonier Co., 911 North Broadway, St. Louis, manufacturer of electric refrigerating equipment, etc., has purchased Gustav J. Gruendler Mfg. Co., 814 North Broadway, manufacturer of commercial electric refrigerator units, and will consolidate. Different units include company last noted, Hussman Refrigerator Co., and Ligonier Refrigerator Co., as well as Steiner Mfg. Co., address stated. Expansion is planned in different types of electrically-operated refrigerator equipment. A subsidiary has been formed under name of Allied Store Utilities Co., for sales and distribution.

Springfield Tablet Mfg. Co., 300 North Jefferson Street, Springfield, Mo., manufacturer of commercial paper products, has asked bids on general contract for two-story L-shaped factory, 60 x 120 ft., with one-story unit adjoining, 50 x 60 ft., to cost more than $75,000 with equipment. Baldwin & Baldwin, Magnolia Building, Oklahoma City, Okla., are architects.

Shell Development Co., affiliated with Shell Petroleum Co., Shell Building, St. Louis, has acquired 135-acre tract near Long Beach, Cal., as site for new nitrogen fixation plant, for which plans will be prepared at once. Initial unit will be equipped with electrically-operated machinery, and will cost about $250,000. Entire project will cost over $1,000,000 with equipment.

All-Steel Products Mfg. Co., 300 South Wichita Street, Wichita, Kan., has awarded general contract to Aaron Wilson, 217 South Terrace Drive, for one-story plant to cost about $40,000 with equipment. Ted Mason, Miller Theater Building, is architect.

Moon Motor Car Co., 4400 North Main Street, St. Louis, has purchased plant rights and property of Ruxton front-drive automobiles, heretofore held by New Era Motors, Inc., St. Louis, and will arrange for early production at local plant, where manufacture will be concentrated in future.

Mine-LaMotte Co., Bonne Terre, Mo., has purchased a 42 in. x 21 ft. motor-driven Putnam lathe from Manning, Maxwell & Moore, Inc.

Missouri Pacific Railroad has purchased a locomotive crankpin grinder and a Monarch 24 in. x 14 ft. geared-head motor-driven heavy-duty geared-head lathe.

Gulf States

BIRMINGHAM, Dec. 3.—Contract has been let by Motor Tool Specialty Co., 2119 Commerce Street, Dallas, Tex., to Cowdin Brothers, Dallas, for one-story plant, 50 x 100 ft., to cost about $25,000 with equipment.

Texas Milk Products Co., Marshall, Tex., has asked bids on general contract for one-story milk processing plant at Mount Pleasant, Tex., to cost about $175,000 with equipment.

Crane Co., 836 South Michigan Avenue, Chicago, has taken bids on general contract for a factory branch, storage and distributing plant at Jacksonville, Fla., three stories, 100 x 105 ft., to cost about $100,000 with equipment.

Perry Burrus Elevators, Inc., Dallas, Tex., has authorized addition to local grain elevator, to include elevating, conveying, screening and other equipment, to cost over $1,000,000 with equipment.

West Texas Utilities Co., Abilene, Tex., is arranging an expansion and improvement program to cost about $5,000,000, including increase in generating facilities, power substations, transmission lines and other work.

State Highway Department, Austin, Tex., is considering erection of a one-story mechanical and repair shop for road machinery work, and one-story equipment storage and distributing plant at Dallas, Tex., to cost over $50,000 with equipment.

Roosevelt Flying Service, West Palm Beach, Fla., W. P. Lawless, in charge, has acquired local property for establishment of airport, to include hangars for housing about 20 airplanes, repair shops, oil storage and other field units, to cost more than $100,000 with equipment. Company is a subsidiary of Aviation Corporation, 122 East Forty-second Street, New York.

Board of Education, Birmingham, plans installation of manual training equipment in new West End high school, bids for first unit being asked by Dec. 13, to cost $750,000. Warren, Knight & Davis, Protective Life Building, are architects; William B. Ittner, Board of Education Building, St. Louis, is consulting architect. D. E. McKinley is business manager.

City Council, Gulfport, Miss., has plans for extensions at municipal airport, to include new hangar to accommodate six airplanes, with repair facilities and other field units, to cost over $50,000.

Minden Cotton Oil & Ice Co., Minden, La., has plans for a new factory for manufacture of commercial fertilizer, to cost over $65,000 with equipment.

Board of Education, Tyler, Tex., is planning installation of manual training equipment in two new junior high schools to cost $261,000, for which bids will soon be asked on general contract. Bryan & Sharp, Dallas, Tex., are architects.

E. F. Slayton Co., Orlando, Fla., plans construction of a cold storage and refrigerating plant in connection with new abattoir, including installation of conveying and other mechanical-handling equipment, to cost about $100,000. E. F. Slayton, 525 Howard Avenue, is head.

Bell Oil & Gas Co., Kennedy Building, Tulsa, Okla., has approved plans for new oil refinery near Pampa, Tex., with initial capacity of 4000 bbl. per day, including gasoline division, to cost over $200,000.

Indiana

INDIANAPOLIS, Dec. 2.—Haynes Stellite Co., Kokomo, has awarded general contract to L. P. Hutto, 1030 West Maple Street, for one-story addition, 75 x 125 ft., to be used primarily as a foundry, to cost about $50,000 with equipment.

O. P. Link Handle Co., Salem, has authorized rebuilding part of plant destroyed by fire Nov. 23. Reconstruction will be designed to double former capacity and will cost about $50,000 with equipment.

Capehart Automatic Phonograph Co., East Pontiac Street, Fort Wayne, will take bids early next year for one-story addition, to cost about $30,000 with equipment. Charles E. Weatherhogg, 250 West Wayne Street, is architect.

Inca Mfg. Co., Fort Wayne, manufacturer of wire and cables, has awarded a general contract to Buesching & Hagerman Construction Co., 402 East Superior Street, for one-story unit, 200 x 300 ft., to cost over $75,000 with equipment.

Engineering Metal Products Corporation, Indianapolis, has been organized to take over and consolidate T. Roch Iron Works, 600 Dorman Street, manufacturer of ornamental iron products; James H. Carnine & Co., 311 East South Street, building products, including fireproofing materials; Central Wire & Iron Works, 119 West Norwood Street, manufacturer of elevator doorway equipment, etc., and Diamond Wire & Iron Works, 310 East Empire Street, manufacturer of office and factory partitions, etc. Consolidated company plans general expansion. Lease has been secured on property at 401 South Harding Street, where headquarters will be maintained. James H. Carnine is president of new organization; F. G. Phillips, vice-president; George H. Roch, treasurer, and Ralph E. Finley, chief engineer.

Auburn Automobile Co., Auburn, has authorized an expansion program to increase present output by 50 per cent, including new units now in progress, to cost about $3,500,000 with machinery. Program includes extensions at plant of Central Body Co., Connersville, and expansion at Auburn-Connersville automobile works.

Pacific Coast

SAN FRANCISCO, Nov. 27.—Bids have been asked on general contract by Board of Works, Oakland, Cal., for municipal mechanical and equipment buildings, 200 x 200 ft., including machine shop, repair shop, paint shop and other units, to cost $75,000 with equipment. L. C. and D. D. Stone, Great Western Power Building, are architects.

Byron Jackson Pump Co., 55 New Montgomery Street, San Francisco, manufacturer of pumps, parts, etc., has filed plans for one-story unit at Berkeley, Cal., to cost about $30,000 with equipment.

Pacific Gas & Electric Co., 245 Market Street, San Francisco, has secured permission for a hydro-electric power project on Mokelumne River and will proceed with project at early date, to cost $19,000,000 with transmission system. Company is arranging an expansion program to cost about $35,000,000, including extensions in hydro-electric and steam power properties, transmission lines, switching stations, distributing lines and miscellaneous work. Natural gas properties also will be extended and developed.

Woodruff-Margetts Coal Co., Salt Lake City, Utah, has plans for a coal-carbonizing plant, to cost about $65,000 with equipment.

Sunset Pacific Oil Co., Sixteenth Street, S. W., and Hanford Street, South, is planning new oil storage and distributing plant to cost about $75,000 with equipment.

Board of Education, San Francisco, is considering installation of manual training equipment in third unit at South Side high school, to cost about $700,000, for which plans will be prepared by Bakewell & Weihe, 251 Kearny Street, architects.

In connection with an expansion program to cost $50,000,000, Southern Pacific Railroad Co., Los Angeles, is planning purchase of track-building and kindred equipment, including cranes, ditchers, steam shovels, etc. Extensions and improvements will also be made in a number of car and locomotive repair shops, with installation of additional equipment.

Boise Machine & Welding Works, Inc., Boise, Idaho, has leased a one-story building, 50 x 120 ft., to be erected at 1401 Idaho Street, and will occupy for a new plant, to cost about $30,000 with equipment. Tourtellotte & Hummel, Boise, are architects.

Southern California Gas Co., Los Angeles, has applied for permission to purchase properties at Madera and Turlock, comprising holdings of Madera Gas Co., and Turlock Gas Co., and will consolidate. Expansion is planned, including pipe line construction.

Canada

TORONTO, Dec. 3.—Current demand is chiefly for replacement needs, with occasional lists calling for a half dozen tools. Some good orders are pending for new works, but much of this business will be held over until after the first of the year. While there has been curtailment in demand, business, as a whole, is holding well above that of a year ago.

J. D. Adams Mfg. Co., manufacturer of railroad shop machinery, has purchased an existing plant and eight acres at Paris, Ont. Plant will be operated by a subsidiary to be known as J. D. Adams (Canada), Ltd., and will supply Canadian demand and some export trade.

S. C. Johnson & Co., Brantford, Ont., manufacturers of radiator cement, etc., will build an addition to cost $50,000.

Town Council, Hespeler, Ont., contemplates installing additional pumping apparatus in waterworks plant. M. E. Jardine is clerk.

Niagara Cut Stone Co., Ltd., Niagara Falls, Ont., has awarded contract to Smith Brothers, 1740 Ellen Avenue, for erection of a factory.

Cunningham & Son, 285 Queen Street, St. Catharines, Ont., have let contract to W. W. Park, 49 Queen Street, for erection of a foundry to replace one destroyed by fire.

Peerless Artificial Stone Co., Rhodes Avenue, Toronto, Ont., is receiving bids, no closing date set, for a factory to cost $20,000.

Bids are being received by D. R. Brown, architect, 980 St. Catharine Street West, for an addition and alterations to plant of Jenkins Brothers, 617 St. Remi Street, Montreal, manufacturers of valves, etc.

La Cie Electrique de Riviere a Pierre, Ltd., 72 Mountain Hill, Quebec, contemplates building an addition to power plant at Riviere a Pierre, Que., and will install waterwheel of 300-hp. capacity; one 225 kva. generator, and one 48-ft. diameter penstock, 450 ft. long. C. Lessard, 32 Boulevard des Allies, Quebec, is engineer.

Western Canada

Canadian National Railways is proceeding with erection of new car shops at Melville, Sask. A. A. Tisdale, Winnipeg, is general manager.

New Westminster Paper Co., Ltd., New Westminster, B. C., has awarded contract to Dominion Construction Co., for erection of a paper mill to cost $150,000.

Foreign

A CONTROLLING interest in Bavarian Motor Works, Ltd., Munich, Germany, has been secured by Pratt & Whitney Aircraft Co., Hartford, Conn., manufacturer of Wasp and other aircraft engines, a subsidiary of United Aircraft & Transport Co., 51 Pine Street, New York. Purchasing company will be active in management and will develop Munich plant for production of aircraft motors and parts for Continental trade.

Ford Motor Co., Detroit, is negotiating for land at Kastrup airdrome, Copenhagen, Denmark, and plans construction of plant for airplane division, including parts and assembling departments, to cost over $750,000 with machinery. Company is carrying out expansion at tractor manufacturing plant at Cork, Ireland, and will increase output from 125 to 300 complete tractor units per day. In connection with plans for importations to United States, it is proposed to build two or more assembling plants near ocean ports for domestic business.

Royal Dutch Petroleum Co., Amsterdam, Holland, operating Shell Oil Co., San Francisco, with other subsidiary units in United States, as well as oil refining properties in different parts of the world, has authorized an increase in capital from 600,000,000 to 1,000,000,000 florins (about $240,000,000 to $400,000,000, United States currency), part of proceeds to be used for expansion and improvements, and acquisition of other oil lands and plants.

Municipal Council, Juarez, Mexico, is considering early call for bids for equipment for municipal waterworks, including pumping machinery, power equipment, compressors and auxiliaries, to cost over $200,000.

Farnum Aircraft Co. of France, Paris, has purchased 75-acre tract in Belmont County, near Shadyside, Ohio, and plans early construction of American branch plant, including parts production and assembling, to cost more than $250,000 with equipment.

Rhine-Westphalia Electric Power Corporation (Rheinisch-Westfaelisches Elektrizitaetswerk), Berlin, Germany, has authorized increase in capital from 180,000,000 to 240,000 marks (about $45,000,000 to $60,000,000 United States currency), part of fund to be used for expansion in electric generating plants and systems, including development of new properties.

New Trade Publications

Electric Furnaces and Pyrometers.—Hoskins Mfg. Co., Detroit. A beautifully illustrated 40-page book, identified as catalog No. 52, has been issued by this company. It is divided into three parts, the first of which is de-

voted to a description of Hoskins electric furnaces in the larger sizes for industrial purposes, the second to smaller types commonly used in the laboratory and the third to Hoskins pyrometers. The question, "What is good furnace design?" is discussed in the fore part of the catalog. In the rear of the catalog is a compilation of data regarding methods of heat treating steel, and S.A.E. steel specifications.

Chromel.—Hoskins Mfg. Co., Detroit. Catalog G, consisting of 40 pages, describes the properties of resistance wire, thermocouples, electric furnace ribbon and heat-resisting alloys made of Chromel. In the rear part of the catalog are published tables of Fahrenheit and Centigrade equivalents, fraction and decimal equivalents, comparison of wire gages and conversion factors.

Automatic Control Recording Pyrometers.—Brown Instrument Co., Philadelphia. A four-page folder describes the satisfactory operation of the company's pyrometers in two industrial plants.

Truscon Ferrobord Ingot Iron Roofdecks.—Truscon Steel Co., Youngstown, Ohio. A 16-page booklet is devoted to erection data and specifications of roofdecks and is designed for the practical roofer and roofing contractor.

Steel Castings.—Lebanon Steel Foundry, Lebanon, Pa. A four-page illustrated leaflet describing a motor truck transmission case of intricate design, suitable for motor trucks where particularly heavy duty is involved.

Sash Weights.—Deved Brothers, Inc., 807 South Howard Street, Baltimore. An illustrated leaflet describes the patented combination core box for making sash weights on a large scale.

Foundry Cupolas.—Whiting Corporation, Harvey, Ill. An eight-page pamphlet, entitled "An Analysis of the Performance of 54-Inch Cupolas Based Upon Records of Practical Operation," is one of a series of papers on Cast Iron and Its Manufacture by Dr. Edward E. Marbaker, director of foundry research of the company. Among other subjects it discusses the temperature of the molten iron, the coke consumption, thermal efficiency and the theoretical calculation of coke and air.

Power Plant Equipment.—Chain Belt Co., Milwaukee. Folder of four pages illustrating and describing Rex handling and screening equipment for industrial power plants and central stations.

Water Wheels.—James Leffel & Co., Springfield, Ohio. Bulletin W208 illustrates and describes three units of type Z vertical-shaft turbines, 450 to 825 hp., each direct connected to 3-phase, 60-cycle, 2300-volt vertical generator.

Pumps. — Economy Pumping Machinery Co., Chicago. Bulletin 412 of seven pages and Bulletins 413 and 414 of 11 pages each, illustrate and describe various types of non-clogging sewage ejectors, open-shaft vertical and horizontal pumps and split case multi-stage centrifugal pumps.

Steel Shop Equipment. — Standard Pressed Steel Co., Jenkintown, Pa. Form 416 illustrating and describing various types of steel desks and benches for use in shops, factories, warehouses, etc.

Studies in Structural Welding.—Lincoln Electric Co., Cleveland. A series of eight 8½ x 11 in. leaflets illustrating important structural frames, welded in whole or in part, and detailed sketches of welded joints and girders.

The Week's News Quickly Told

Current Events That Bear on the Course of Business

PRESIDENT HOOVER met representatives of agriculture and public utilities in two conferences. The latter told him of plans to expend $1,800,000,000 for extensions and betterments during 1930. The former said that improvement of farm-to-market roads and maintenance of easy credit will be most effective means of governmental cooperation with agriculture.

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RETAIL clothing trade is brisk, due to cold weather. Textile manufacture, however, is generally slow. New England industry is feeling the effects of acute depression in Massachusetts cotton mills.

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CONSTRUCTION activities enter their usual winter slump. A survey by Engineering News-Record indicates that new building in 1930 will total the average of 1928 and 1929.

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GRAINS are noticeably higher in price, and Chicago trade reflects the improvement. Tobacco manufacturing is brisk; good prices for the leaf and for cotton lend good tone to conditions in South and South East. Wholesale and jobbing trade is slow and uncertain, especially in Middle Western States.

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PACIFIC North West is suffering from a prolonged drought. Hydro-electric power plants are all but shut down, and electricity is rationed for essential purposes . . . Fisheries, the main industry, have a pack ranking among the six best years in history. Lumbering, however, is much below normal, and unsold stock is increasing. Shingles are selling at lowest prices in years.

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SHIPBUILDING firms closed contracts for 213,000 gross tons of vessels during October, as much as an ordinary year's business . . . Thirteen new mail routes to foreign ports are established and offered to those American steamship lines which meet the Post-Office Department's requirements for vessels equal to or better than any competing foreign ships. About 40 new vessels will be required, costing about $250,000,000, 75 per cent of which will be financed by governmental loans . . . Port of New York Authority will build four 1200-ft. piers at Jersey City, together with belt line railroad and super-highway connecting with established trunk lines . . . Weser Shipbuilding Co., builder of the Bremen, reports large deficit and proposes wage reduction.

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PATENT office is so far behind that at present rate it will be six years before work is current, reports Commissioner Robertson, asking for at least 100 new examiners.

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CONSOLIDATION of two large Southern dairying enterprises marks another of a series of mergers in the food industry . . . General Baking Corporation, which has grouped about 50 bakeries, has completed a 5-year modernization program costing $18,000,000, and announced a reduction in the price of bread . . . Memphis and Cleveland wholesale drug houses merge and announce plan of cooperation with 20,000 independent druggists . . . Dissolution of Warner and Fox film enterprises is sought by Federal suit.

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DIVIDENDS were increased or extras declared by 211 corporations during November; 21 usual dividends were passed. New Haven railroad, which resumed dividend payments a year ago after a lapse of 15 years, increased its rate to $6 annually.

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AIRPLANE fares from Kansas City to Los Angeles are reduced for a 30-day trial period to about the same as rail plus Pullman plus meals, by Western Air Express, which has traffic arrangements with a score of Central trunk railroads . . . A 19-hour air-rail service is inaugurated from Cincinnati to New Orleans . . . Commercial aeronautics have a bright future in Central and South America, said C. A. Lindbergh, because other systems of transport are unusually slow and undeveloped . . . Capt. L. M. Woolson, designer of the Packard Diesel aviation engine, said it will cut the fuel load 20 per cent for a given radius of flight . . . A marked reduction in accidents is reported by the commander of the Army air corps, due to the perfection of the mechanism and rigid inspection requirements. Pilot errors constitute the major cause of fatal accidents . . . England adopts a "robot" pilot weighing 100 lb. as standard equipment on larger army and navy aircraft. It has flown bombing planes 400 miles without adjustments.

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ARMY strength of the United States is 137,529, reports Adjutant General . . . General Jan C. Smuts of South Africa said that aerial disarmament is more urgent than military limitation, as it constitutes the more serious danger . . . E. N. Hurley, in a proposal to Internation Chamber of Commerce, writes that a few powerful industrialists, controlling strategic minerals and munitions could effectively support Kellogg peace treaties by refusing all trade with belligerants.

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FRENCH troops are withdrawn from second zone of occupied area in Rhineland . . . Iceland, with 100,000 inhabitants is shocked by the news of its first murder in 16 years . . . A new traffic law in England abolishes the dead-letter speed limit for light cars, but imposes very severe penalties for dangerous or intoxicated driving, or exceeding 30 miles per hour with buses or trucks.